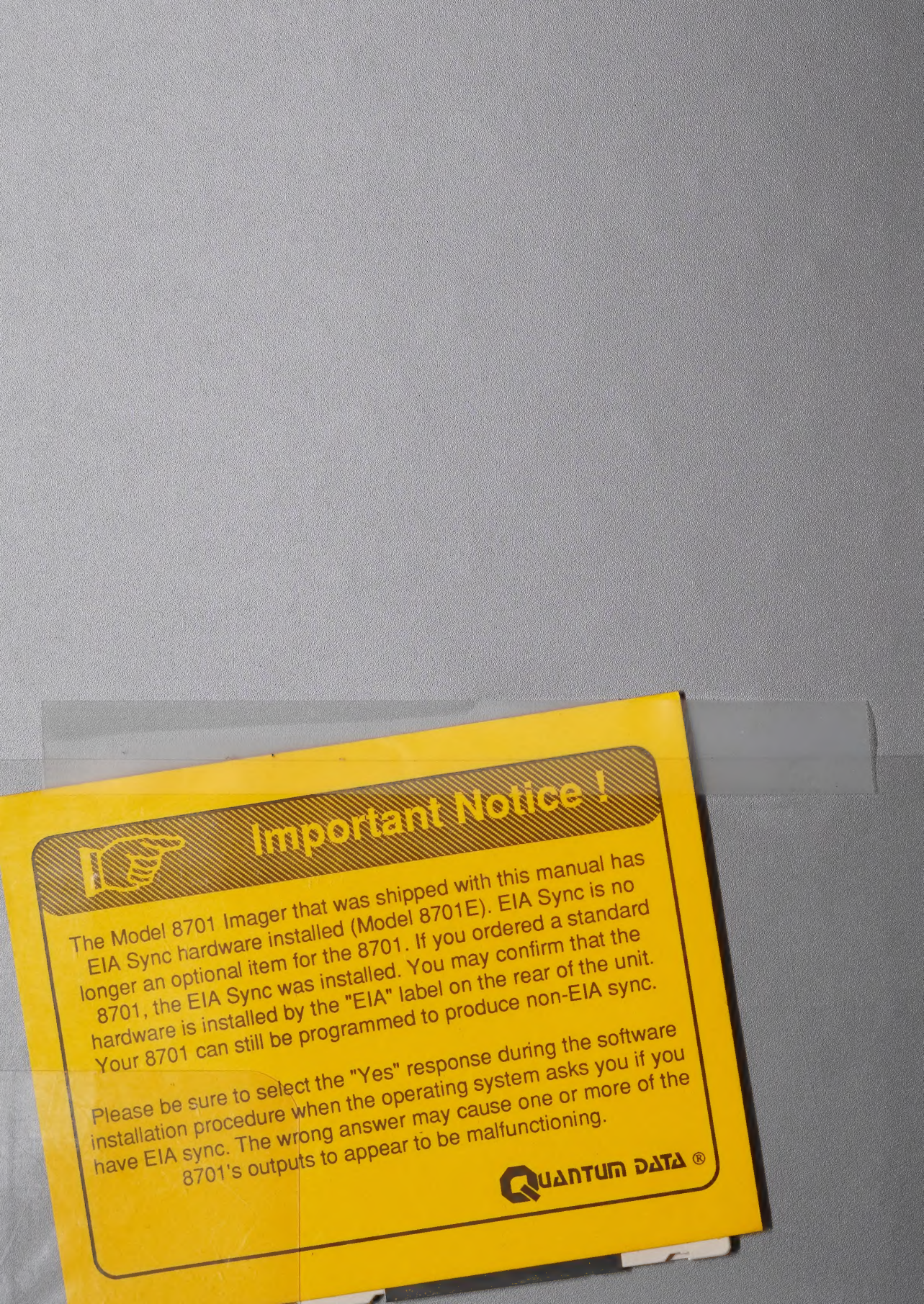
QUANTUM DATA


Important Notice !
The Model 8701 Imager that was shipped with this manual has EIA Sync hardware installed (Model 8701E). EIA Sync is no longer an optional item for the 8701. If you ordered a standard 8701, the EIA Sync was installed. You may confirm that the hardware is installed by the "EIA" label on the rear of the unit. Your 8701 can still be programmed to produce non-EIA sync.
Please be sure to select the "Yes" response during the software installation procedure when the operating system asks you if you have EIA sync. The wrong answer may cause one or more of the 8701's outputs to appear to be malfunctioning.
QUANTUM DATA ®

CHUCK

QUANTUM DATA®

FOX Video Generators
Model 8701
Model 8701E

Owner's Manual

For Operating System Software
Version: 2.8

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Using this Manual

For the User in a Hurry

For those of you that just want to take the 8701 out of the box and start using it with your display, without having to "Read" the manual first, we suggest that you at turn to the two pages in the "Quick Start" chapter.

For the First -Time User with a Few Minutes

Start by going through the "Getting Started" chapter. This will give you general information on becoming familiar with the 8701. The "Operating Tasks" chapter provides you with step by step procedures and examples of operations on the 8701.

The FOX overview, a little later in this chapter, explains the concept of the FOX series of video generators.

For the Experienced User

Once you have become a familiar with the 8701, you will probably not have to refer to this manual often. If you have a specific problem or question, this manual's table of contents and index will guide you to the pages with the answer.

About Other Manuals and Documentation

The contents of this document fully cover the use of all of the standard features of the FOX 8701 mainframe running a specific version of the operating system software. The software version is identified on the front of this document and on the original boot disk label.

Information on all currently supported Video Plug-ins is included in this manual. Additional documentation on using the various video plug-ins is supplied with each plug-in. You may wish to add the video plug-in documentation to the chapter in this manual, "Video Plug-Ins".

Information on using certain software options for the 8701 are fully documented in this manual. Documentation for other options mentioned in this manual will be provided with the option .

An Overview of the entire FOX series

Modular Concept

Quantum Data's 8700 series FOX generators represent a major advance in imaging technology. Powerful, flexible and innovative, the FOX is adaptable to an extremely wide variety of video test applications.

Various versions of the mainframe allow you to use the FOX as a stand-alone piece of equipment or as part of a complete ATE system. You can also get a version that allows switching between both types of operation. The mainframe contains the user interface(s), the graphics processor and the video memory. The mainframe provides 64 bits of video at up to 25 MHz. This video data is fed to the video output plug-in.

A video plug-in contains the necessary parallel-to-serial shift registers, look up tables, digital-to-analog video converters as well as the pixel and sync clock generators. A variety of video output modules let you tailor the FOX to match your current video signal needs at a price that you can afford. If you need additional performance at a later date you do not need a whole new generator, just get a new plug-in. Modularity is the key; buy only what you need now and expand later.

The Mainframe

The 8701 Imager is the stand-alone version of the FOX 8700 series. The user interface is built into the mainframe's "intelligent" front panel.

Available Options

Video Hardware

The 8701 Imager is normally sold with a user-specified video output plug-in and operating system software. The following video output plug-ins are currently available:

ACF-250	Three analog video outputs at up to 25Ø MHz. Composite sync may be added to any or all analog video channels. Four (4) separate TTL sync channels.
ACF-400	Three analog video outputs at up to 4ØØ MHz. Composite sync may be added to any or all analog video channels. Four (4) separate TTL sync channels.
BCF-125	Three analog and eight digital video outputs at up to 125 MHz. Composite sync may be added to any or all analog video channels. Four separate digital sync channels. Digital video and sync outputs available at both TTL and at differential ECL levels.

The following adapter is available:

D-403S	Three channel analog-to-digital converter. When attached to an ACF-25Ø or ACF-4ØØ, will generate digital video at differential ECL levels. The maximum pixel rate is the same as the the maximum rate of the particular Video Plug-in.

In order to use the 8701, one of the video output plug-ins must be installed and the operating system software must be configured (installed) for that plug-in. Plug-ins may be removed and installed by the user.

Additional User Interface

The following computer interface is currently available as an option for the 8701:

UI-PC	A hardware and software package that permits the user to control an 8701 Imager (with any video plug-in installed) using an IBM-PC or equivalent computer. A proprietary high speed interface cable connects the 8701 to an interface card installed in an expansion slot on the PC. The software, running on the PC, provides a spreadsheet type user interface for setting up timing formats and selecting the test and demo images. The software also supports a supplied mouse for easier selection of items on the spreadsheet.

Service Contracts and Product Updates

It is the intent of Quantum Data to provide our customers with the highest quality service both before and after the sale. It is with this in mind that we make several types of support services available. The 8701 has been designed for years of dependable operation. However, like any complex piece of equipment, a scheduled plan of preventative maintenance and calibration will insure maximum performance.

FULL Service Support Agreements beyond the standard warranty period may be purchased. This Service Support program covers repairs, calibrations, hardware updates.

Service contracts are also available for the operating system software. Software service contracts will provide you with the latest software updates and telephone assistance during the contract period.

Please contact Quantum Data's customer service department or your sales representative for information concerning the exact terms and conditions of service contracts.

For those of you that just want to take the 8701 out of the box and start using it with your display, without having to actually "Read" the manual first, we suggest that you at least go through the following steps:

- **Verify that you received everything shown on the packing list.**

  The "Getting Started" chapter of this manual has more information on unpacking.

- **Connect your display to the 8701's outputs.**

  The output connectors are fully labeled. Be sure to match the output impedance(s) of the outputs. The ACF-4ØØ module comes with separate shunts to match a 75Ω display to its 5ØΩ outputs.

- **Plug the 8701 into the correct line voltage outlet and turn it on.**

  The unit is shipped configured for 120 Volt AC operation. See the "Connecting AC Power" heading in the Operating Tasks chapter to use the 8701 at other line voltages. The outlet that you use must provide for grounding the 8701 through its power cord. The unit will go through its self test when turned on.

- **Insert the operating system disk.**

  Do this after the shipping protector is ejected from the disk drive. The shipping protector will automatically eject from the disk drive. After booting the software, the LCD should look like this:

  ```
  [format00]
  ```

  If you are not the first-time user of the system disk, additional "formats" may also show up on the LCD. The system microdisk comes with one default "Format" on it (formatØØ). A format is a collection of parameters that describe the signal requirements of a particular display.

- **Match the operating system software to the video plug-in.**

  Press the "Macros" button and then select "Install" from the menu that appears. Select the correct answer(s) that describe the Video Plug-in module you are using.

- **Enter your Format.**

  If more than one format exists on the disk, select "formatØØ" and then press the "Line Rate" button. The LCD should now look like this:

  ```
  format00    Raster
    Line       Rate    [ 31.500 ]     KHz
  ```

  If you are not the first-time user of the disk, a value other than 31.5ØØ KHz may appear.

  Starting with "Line Rate", enter your values for each of the thirteen (13) Format parameters that have a black border around the button on the front panel. Figure 2-1 shows the general syntax for selecting a parameter and changing its value. Set-up the

sync and video outputs to match your display's requirements. Step-by-step procedures for driving six common types of displays are presented in the chapter on "Operating Tasks". The types of displays and the page number of the procedures are:

- Color Analog Video with Separate Digital Sync(s) (See page 41)
- Color Analog Video Combined with Composite Sync (On Green) (See page 43)
- Monochrome Analog Video with Separate Digital Sync(s) (See page 45)
- Monochrome Analog Video Combined with Composite Sync (See page 48)
- Color Digital Video with Separate Digital Sync(s) (See page 50)
- Monochrome Digital Video with Separate Digital Sync(s) (See page 53)

See the "Operating Tasks", "Reference" and "Error Messages" chapters of this manual for more information on entering formats.

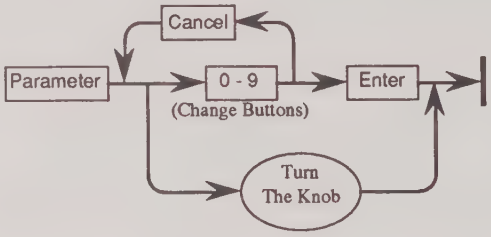

Figure 2-1
Parameter Entry Syntax Diagram

- **Select an Image.**

  Press the "Images" button. The LCD will now show a menu that looks like this:

DEMO	GENERAL	SPECIAL	CUSTOM
SETUP	GEOMETRY	COLOR	FINAL

  Press the "Select" button 5, below "Setup", to go to the next menu. Then press button 5 again, below "Controls", to draw the "Controls" test image. A full description of all of the images may be found in the "Images" chapter.

- **Turn the outputs on.**

  If the "Outputs" light is off, press the "Outputs" button to toggle the outputs on.

- **Fine tune your Format.**

  Select and change your format's parameters, as required, to produce a correct image on your display. Some format changes may scramble the displayed image and require you to press the "Images" button twice, slowly, to redraw the image.

- **Save your Format.**

  Press the "Done" button to the right of the LCD. The LCD will display your available choices for dealing with the format. The Operating Tasks chapter contains additional information on "Saving Your Format".

- **Where next?**

  The table of contents and the index in this manual will guide you to the pages containing answers to any questions you may have.

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Unpacking

Supplied Items Checklist

Remove all of the materials from the shipping carton and make sure you have everything shown on the packing list included with each shipment. If anything is missing, contact your Quantum Data representative or our customer service department immediately. If the carton or any of the items appear to be damaged, notify the carrier immediately.

Optional Items

If you ordered your 8701 with more than one video plug-in module, the additional modules and any associated software and test cables will arrive in separate cartons. Check the packing slip, attached to the carton to determine the number of cartons in your shipment. Certain options are installed in the 8701 prior to shipment.

Saving Packing Material for re-use

Do not dispose of any shipping cartons or packing material until you are sure that you have everything shown on the packing list(s) and that no damage occurred during shipment. Save the carton(s) and packing material to reuse for sending a unit back for future calibration and / or repair. The shipping material has been designed for limited reuse and should not be used for transporting the equipment on a regular basis. Contact your Quantum Data representative for information on transport cases designed for the FOX.

The 8701 is shipped with a protector in the disk drive. Do not dispose of it. The protector must always be in the disk drive whenever the unit is being transported or shipped. Failure to use this protector may cause permanent damage to the read/write heads. This damage is not covered under product warranties. If you lose the protector, use any 3-1/2 inch microdisk in its place.

Quick Power-Up Test

This is a quick check procedure to make sure that the 8701 was not damaged during shipment:

- The unit is configured for 120 volt AC operation when it is shipped. See the chapter on Operating Tasks for information on operating the 8701 at other power line voltages before you plug anything in.
- Once you have the 8701's power cord installed and plugged into the the correct line voltage; turn the unit on.
- The 8701 will go through its self test and configuration check. There should be no error messages.
- The drive protector will be automatically eject from the front panel disk drive. Save it. The 8701 must always have the protector in place whenever it is moved and a chance of the unit being jolted exists.
- A message will flash on the LCD requesting that the operating system boot disk be inserted. You may verify that the disk drive is functional by inserting the boot disk (disks are inserted with the label to the left). It will take a a minute or two for the software to load.

- This is all the testing that you can perform without actually getting into the operation of the unit.
- To replace the boot disk with the protector, first turn the power off. While pressing the "Cancel" button on the numeric keypad, turn the power back on. This will cause the disk to eject.

Additional User Supplied Items

Required

Depending on the type of video plug-in being used and the type of input connector on your display, you will most likely have to make up a test cable.

The 8701 is supplied with the correct fuse installed for both 100 Volt and 120 Volt power line operation when it leaves the factory. You will have to supply the correct fuse for use at other voltages. Information on the type of fuse required is found in the Specifications section of the Appendices.

Optional

You should not use the supplied operating system boot disk to save your work. We strongly recommend that you make back-up copies of the supplied boot disk onto your own blank disks. See the chapter on Operating Tasks for information on initializing and duplicating disks. The 8701 uses double sided / double density 3-1/2 inch micro-floppy disks. These disks have a total capacity of 720K bytes (when formatted by the 8701). To forestall the loss of valuable data, a high-quality brand of error-free disks is recommended.

A Closer Look

This part of the chapter contains information on where the 8701's various controls, connectors and other hardware details are located. A brief discussion of their function is also included.

The next two facing pages identify the major items on the front panel.

8701 Front Panel

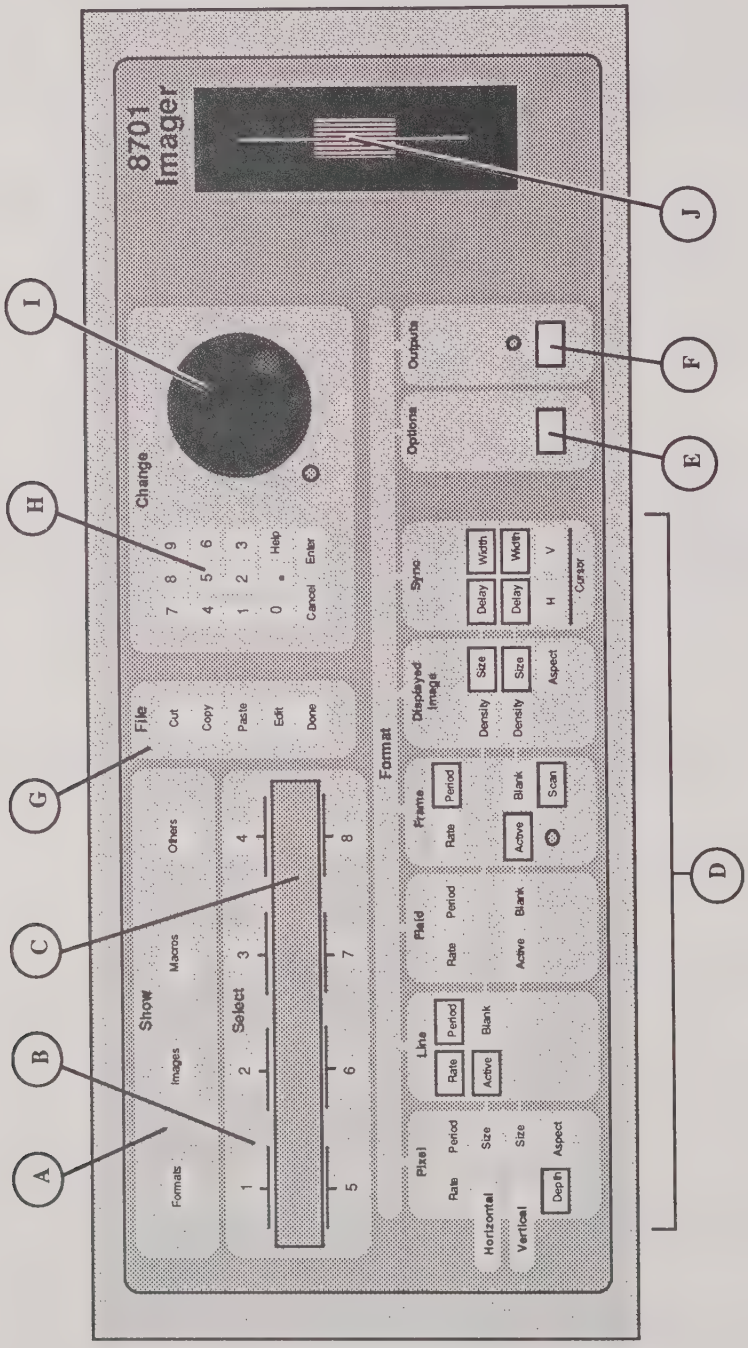

Figure 3-1 8701 Front Panel Layout

The front panel of the FOX is shown in Figure 3-1. The major features of the front panel are as follows:

A Show Buttons ..... These buttons control the type of information that is displayed on the LCD. They allow you to rapidly switch your attention from one aspect of the FOX to another with a single key stroke.

B Select Buttons ..... These buttons are programmable and do different things at different times. They are located adjacent to the LCD so that words, appearing on the LCD, can be used to indicate the current function of each key.

C LCD..... This is a liquid crystal display. It is used to display function names, file names, signal format parameters, error messages, and other bits of information.

D Format Parameter Buttons .... These buttons provide instant (random) access to the parameters of the current video signal format. Pressing any one of the buttons in this area immediately brings a signal format parameter into view on the LCD. Once displayed, a parameter can be changed using the change buttons or the knob (see below). The LED that is located to the left of the Scan button will be lit whenever the FOX is interlacing.

E Options Button ..... When pressed, this button causes a list of options to appear on the LCD. These options relate primarily to the signal outputs of the FOX. They let you select the type, gating, and establish signal levels for each signal output, independently.

F Outputs Button ..... This button enables and disables all of the outputs of the FOX as a group. All independent gating options are temporarily overridden whenever the outputs of the FOX are disabled using this button. The LED located directly above this button is lit whenever the outputs of the FOX are enabled.

G File Buttons ..... These buttons allow you to manipulate files. MS-DOS compatible files are used to store all information relating to the FOX. The CUT button allows you to delete obsolete files. The EDIT and DONE buttons allow you to open and close files before and after each editing session.

H Change Buttons ..... These buttons allow you to change (or enter) the values of parameters displayed on the LCD.

I Knob..... This is a proportional control that allows you to change the values of parameters incrementally in real-time. The knob is active whenever the LED, located below it, is lit.

J Disk Drive ..... A 3-1/2 inch microdisk (or 'stiffy') drive into which the system microdisk is inserted.

8701 Rear Panel

AC Power Panel

The AC power panel is located in the extreme upper left-hand corner on the rear of the 8701. This panel contains the AC mains power switch and power inlet module. Figure 3-2 shows the details of the power panel.

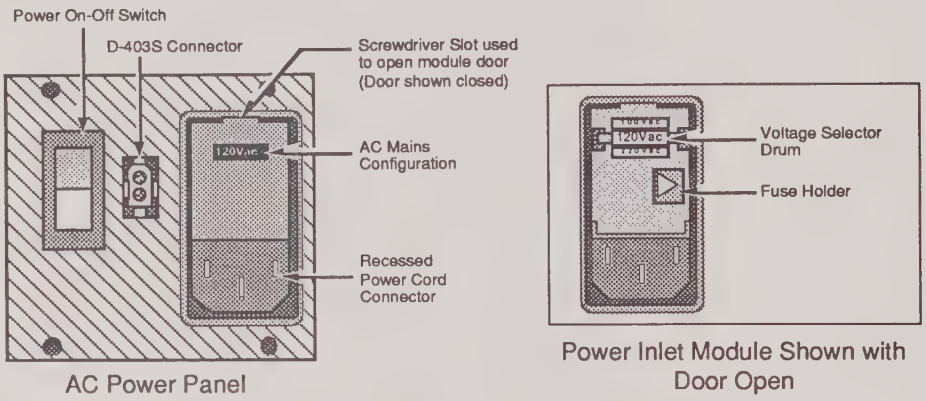

Figure 3-2 AC Power Panel Details (Shown approx. 1/2 size)

Power Switch

The AC Mains power switch is a rocker type. Depressing the lower portion of the switch turns the power off and depressing the upper portion of the switch turns the power on.

Voltage Selector

The 8701 may be operated at one of several power line voltages. The selected operating voltage is shown in a small window near the top of the inlet module. The 8701 is shipped from the factory with 120 Volt AC operation selected. The chapter on Operating Tasks has information on selecting other voltages.

Power Cord Connector

A recessed three-pronged connector (international IEC320 style) is used for supplying AC power to the 8701. The unit is shipped from the factory with the correct mating power cord for use in the United States with 120 volt / 15 amp grounded outlets. Any type of AC power cord used with the 8701 must maintain a proper earth ground to the chassis.

Fuse

The AC Mains fuse is located inside the power inlet module. The chapter on Operating Tasks has information on replacing the fuse.

The 8701 is shipped from the factory with the correct fuse installed for 120 Volt AC operation. The supplied fuse must be replaced with the correct user-supplied fuse for

operation at other voltages. The Specifications, 8701 Mainframe section of the Appendices contains information on the type of fuse required for a given voltage.

D-403S Connector

This connector provides the power required to operate the optional D-403S Analog-to-Digital video converter module.

External I/O Ports

The external I/O ports are located on a panel directly below the AC power panel. The exact types and quantity of connectors installed will depend on what combination of standard and optional I/O ports are installed.

RS-232

The 8701 comes with one (1) RS-232C serial I/O port as standard. The RS-232 connector on the I/O panel is a 25 position, Female, D-Subminiature receptacle. The current version of the operating software does support some printer operations with this port.

HIA

The external Host Interface Adaptor port permits the 8701 to operate as a model 8700 and be controlled by an external computer. This requires the use of an optional hardware/software package, the UI-PC. It is designed to run on an IBM-PC computer, or compatible.

Video Plug-In

The area to the right of the AC power panel and I/O ports is for the video plug-in. Several models of plug-ins are currently available and more are being developed. The 8701 is normally sold with a specific plug-in installed. Please refer to the documentation that is supplied with each module for additional specifications. The chapter on Operating Tasks has information on removing and installing the modules.

Cooling Fan

The 8701 uses room air for cooling its internal electronics. A small internal fan is used for this purpose. The fan operates whenever the the 8701 is powered on. The cooling fan inlet on the right side of the 8701 and exhaust vents on the left side must not be obstructed while the unit is turned on. Never place the unit on its side. This will block the air circulation and cause damage which is not covered under any product warranty.

Important Safety Precautions

Removing and Installing Video Plug-Ins

In order to prevent damage to the 8701 or the video plug-in, certain procedures must be followed when you remove or install it. **A video plug-in must never be removed or installed while the mainframe is plugged into the AC power line.** The Operating Tasks chapter has the step by step procedure for removing and installing the video plug-ins.

Operating without a Video Plug-In Installed

> Do not plug the 8701 mainframe into an AC power source without a video plug-in installed. Doing so will expose you to AC line voltages within the mainframe which may cause a serious or fatal injury! Turning the mainframe on without a video plug-in installed will also expose you to the spinning blades of the internal cooling fan.

Turning the mainframe on without a video plug-in installed will not cause any damage to the mainframe itself.

Cooling Vents

The cooling fan inlet on the right side of the unit and exhaust vents on the left side must not be obstructed from allowing ambient room air to flow through them while the 8701 is turned on. The 8701 is designed to operate in an ambient environment that may be typically found in an engineering lab or on a display production line. Never place the unit on its side as this will block the air circulation and cause damage which is not covered under any of our product warranties.

Line Voltage

The 8701 is designed for operation at the following nominal power line voltages:

- 100 Volts AC nominal.
- 120 Volts AC nominal.
- 220 Volts AC nominal.
- 240 Volts AC nominal.

The unit is configured for 120 Volt operation when it leaves the factory.

> Do not plug the 8701 mainframe into any AC power outlet without first making sure that the 8701 is properly configured for the voltage that you will be using and that the outlet provides proper earth grounding of the 8701's chassis through the power cord.

The warranty for the 8701 does not cover units damaged by operation at the wrong line voltage.

The chapter on Operating Tasks contains a section giving the proper procedure for configuring the 8701 for operation at any of its specified line voltages.

Fuse

The 8701 is supplied with the correct fuse installed for 120 Volt operation when it leaves the factory. You will need to supply the correct fuse for use at other voltages. Information on the type of fuse required may be found in the Specifications chapter of the Appendices. Always use the correct fuse. The warranty for the 8701 does not cover units damaged due to using the incorrect fuse.

Repeated blowing of fuses indicates a serious malfunction of the 8701. The equipment should be sent to one of our service facilities for repairs.

Disk Drive

The 8701 is shipped from the factory with a protector installed in the disk drive. The protector prevents damage to the heads while the unit is being shipped. It is inserted and ejected in the same manner as an actual disk. It must always be in place when you are shipping or transporting the 8701. The warranty for the unit does not cover disk head damage due to not using the protector.

CRT arcs

A high-voltage arc in the cathode ray tube of most displays can generate a high energy voltage spike at the display's input terminals. In some cases, a transient may also be induced into nearby equipment that is not directly connected to the display.

The FOX Video Plug-in Modules have been designed to minimize the affects of transients being fed into their outputs. A low impedance path between the interconnecting cables' shields and the chassis of the display under test will also provide an added level of transient protection. Figure 3-3 shows one such grounding strategy. Connecting a metal ground plane, under the display's chassis, to an earth ground will help protect the FOX from an electrically "Hot" display chassis. The figure shows three (3) signal lines passing through grounded bulkhead connectors. All signal lines from the FOX to the display should have the same type of grounding applied.

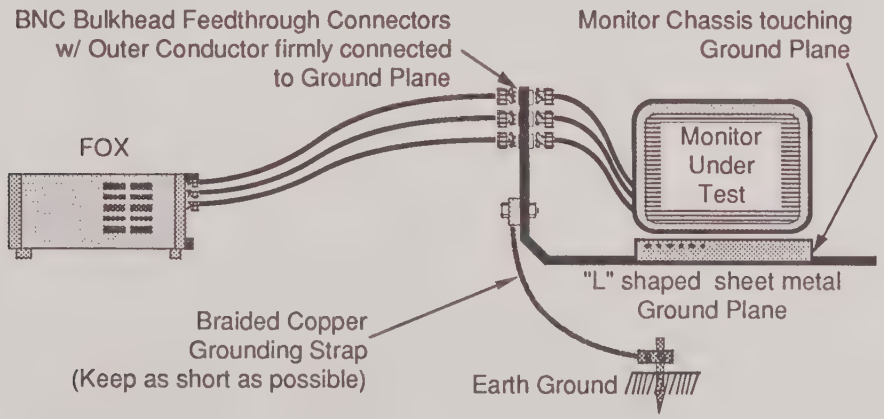

Figure 3-3 Grounding for Improved Transient Protection

Use caution when connecting the 8701 to any CRT-type display, in which the picture tube has never been operated. Newly installed picture tubes may have several internal arcs occur when they are first powered up. If possible, turn the display on and let it run for a few minutes before connecting the 8701 to it.

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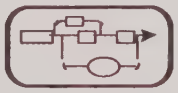
Introduction to Operating Tasks

This chapter contains information on performing specific tasks with the 8701 Imager. Some of the tasks, such as selecting the correct line voltage, may only have to be done one time. Other tasks, such as entering a set of monitor timing specifications, may be performed many times a day.

If you are looking for information on how to perform a specific task, you should first look in the tables of contents located at the front of this manual and at the beginning of this chapter. If you are unable to find the task in the list of topics given, try looking it up in the index at the back of this manual.

Several tasks are presented in the form of a tutorial, or lesson, while others consist of a step-by-step procedure. When appropriate, syntax diagrams are used to give you an encapsulated view on how to perform the task. Operations that involve multiple keystrokes and / or knob rotations will be represented by a symbol that will have miniature syntax diagram inside of it. One such combined symbol will look like this:



Important information that you should remember while performing a task are highlighted by the following symbol:

If you are not familiar with the 8701, you may wish to read the opening paragraphs of each of the following sections in this chapter. This will give you an overview of the unit's many capabilities and features.

Connecting Your Display

There are three (3) video output plug-ins currently available for the 8701; the BCF-125, ACF-25Ø, and the ACF-4ØØ. In order to use the 8701, one of these modules must be installed. An 8701 is normally sold with a video plug-in installed. The plug-ins may be removed and installed by the user. A brief overview of the types of signals available from each plug-in and the types of connectors used will be presented in this section. Detailed information on connecting your particular type of display to a specific video plug-in will be found in a separate chapter of this manual. You may wish to add any future documentation on new modules to the same chapter.

ACF-25Ø and ACF-4ØØ

The ACF-25Ø and ACF-4ØØ are designed to drive analog video displays having a nominal video input impedance of 50Ω. If your display has been designed for this impedance, connect the R, G & B outputs of the video plug-in directly to the video inputs of the target display, using the SMA-to-BNC cables provided (note: SMA-to-SMA cables are available on special order - contact your Quantum Data representative for details). If the video input impedance of the target display is 75Ω, attach the three 150Ω shunts (provided) to the BNC ends of the SMA-to-BNC cables before using them.

When driving analog monochrome displays, just use the GREEN analog output.

The plug-in is capable of generating both analog and (TTL) digital synchronization signals. If the target display requires composite-analog synchronization, no more connections need to be made. If the target display requires separate-digital synchronization, you need to make one or two more connections.

Most displays that require separate-digital synchronization require two additional signals; namely, horizontal sync and vertical sync. If the target display is of this type, connect the outputs of the video plug-in labeled HORIZONTAL and VERTICAL to the corresponding inputs of the target display using the two BNC-to-BNC cables provided.

Some displays require a composite-digital synchronizing signal. In this case, connect the output of the video plug-in labeled COMPOSITE to the corresponding input of the target display using one of the two BNC-to-BNC cables provided.

BCF-125

Analog Video Outputs

The BCF-125 provides three (3) single-ended analog video outputs having a nominal source impedance of 75Ω each. Female BNC connectors are used for all three analog outputs.

The peak-to-peak swing from all three analog video outputs of the BCF-125 can be adjusted over a range of 0.5 to 1.5 volts via a single trimpot. This trimpot is accessible through a small opening labeled "Amplitude". A small screwdriver is required to make this adjustment. Another trimpot, labeled "Calibration", affects the DC biasing of the analog outputs. This control must not be touched.

If the target display has red, green and blue analog video inputs, connect the RED, GREEN and BLUE analog outputs of the BCF-125 directly to those inputs using three BNC terminated 75Ω coaxial cables (not supplied).

When driving analog monochrome displays, just use the GREEN analog output.

If the target display requires a composite video/sync signal, no more connections need to be made as negative-going sync pulses can be superimposed on any (or all) of the analog video outputs of the BCF-125 under program control.

If the target display requires separate digital synchronization, skip the next section and continue with the section entitled "Digital Sync Outputs".

Digital Video Outputs

The BCF-125 provides both single-ended TTL and differential ECL digital video output signals. The logical true level associated with each digital output of the BCF-125 is programmable. Female DB-25 (D-subminiature type) connectors are used for both types of signal outputs. The TTL outputs have a nominal source impedance of 50Ω, whereas the ECL outputs have a relatively low (<20Ω) source impedance (since each ECL output is driven by the usual emitter follower). In either case, 50Ω coax (for example; RG-174) is recommended for all digital connections. The number of signal connections required will depend upon the type of display you are using. A simple monochrome display may require a single video signal. A color display capable of showing up to 64 colors at one time may require six (6) video signals. If balanced ECL level video is required, you will have to make two connections per signal.

Displays requiring a digital video signal will also require one or two additional signals for synchronization, so continue with the next section entitled "Digital Sync Outputs".

Digital Sync Outputs

The BCF-125 can generate both ECL and TTL digital synchronization signals. The ECL synchronization signals are available on a DB-25 connector that is separate from two connectors used to deliver the ECL video signals. The TTL synchronization signals, on the other hand, come out on the same DB-25 connector that the TTL video signals do.

Note that the logical true level associated with each digital output of the BCF-125 can be changed under program control.

The section on "Entering Your Display's Specifications" in this chapter has information on selecting and programming the outputs options.

Selecting AC Line Voltage

Before you plug the 8701 into any AC power source, you must be sure that the 8701 is configured to match the voltage you will be using. Figure 4-1 shows the power inlet module that contains the configuration set-up. The module is part of the AC Power Panel on the rear of the 8701 mainframe.

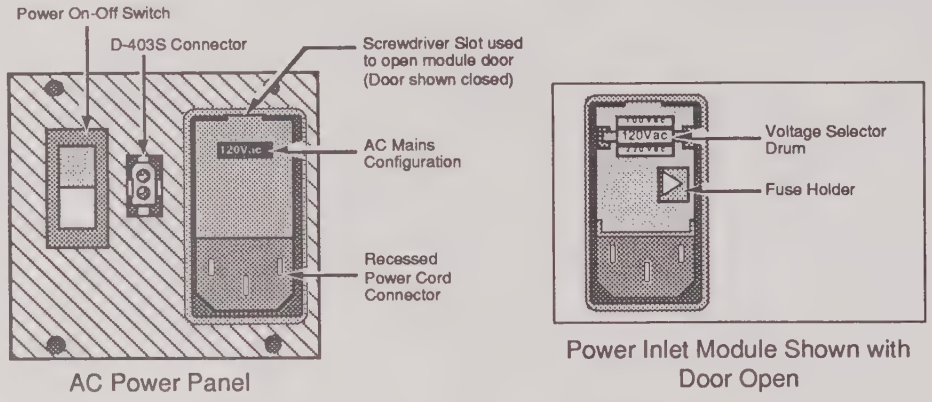

Power On-Off Switch
D-403S Connector
Screwdriver Slot used to open module door (Door shown closed)
AC Mains Configuration
Recessed Power Cord Connector
AC Power Panel
Voltage Selector Drum
Fuse Holder
Power Inlet Module Shown with Door Open

Figure 4-1 AC Power Panel Details (shown approx. 1/2 size)

The selected line voltage is shown in a small window near the top of the module. The following procedure should be followed to configure the 8701 for use at a different line voltage:

1) Make sure that the 8701 is turned off.
2) Disconnect the power cord from the lower portion of the inlet module.
3) Open the cover door of the module by carefully prying open the top of the door. A small flat blade screwdriver should be used for this purpose. Twisting the screwdriver in the slot at the top of the door will cause the door to swing open on its lower hinges.
4) You will see a small drum with various line voltages printed on it. Remove this drum by gripping its sides and pulling it towards you.
5) Select the desired line voltage from the choices available on the drum. The 8701 must only be operated at one of the voltages shown.
6) Replace the drum in the module such that the selected voltage is facing directly towards you.
7) Remove the line fuse by gripping the fuse holder, located inside the module, and pulling it towards you. Remove the fuse from the holder and compare the fuse's specifications against that shown in the Specifications section in this manual's appendices. You must always use the correct fuse for the voltage that you will be using. The 8701 is shipped with the correct fuse installed for use on 120 Volt AC mains. You will have to supply the fuse for use at other voltages.
8) Place the correct fuse in the fuse holder.

9) Replace the fuse holder in the right-hand side of the module so that the direction of the arrow on the holder matches the direction of the arrow printed in the module.

10) Snap the module's cover door shut and make sure that the correct line voltage is showing in the window.

11) Connect the correct power cord to the module. A recessed 3 pronged connector (international IEC320 style) is used as the power inlet. The 8701 is shipped from the factory with the correct mating power cord for use in the United States with 120 volt / 15 amp grounded outlets. Any AC power cord used with the 8701 must maintain proper earth ground to the chassis.

8701 Front Panel Operations

Power-up Sequence

The 8701 goes through a specific power-up procedure whenever you turn on the power. Various patterns and messages will appear on the LCD as the 8701 powers-up. The steps that the unit goes through in this procedure are as follows:

- The 8701 will first check to see if the "Cancel" button, on the front panel, is being pressed. If it is, any disk that is in the disk drive will be ejected. An identifying message, including the firmware's release year, will then appear on the LCD:

```
Model 8701
Quantum Data Incorporated              1988
```

- The interface between the front panel board and the front panel buttons is tested. A problem at this point would give you an "OVERLAY TEST FAILED" error message.
- The interface between the front panel microprocessor and the generator's TMS34010 Graphics System Processor (GSP) is tested. A problem at this point would give you a "GSP INTERFACE TEST FAILED" error message.
- The interface between the front panel board and the knob is tested. A problem at this point would give you a "KNOB INTERFACE TEST FAILED" error message.
- The unit will then blink the LCD backlight and the three (3) front panel LEDs four (4) times.
- The LCD is tested. All 8Ø character positions will display a solid box that will alternately grow vertically and horizontally.
- The current time and date are displayed:

```
Time: 11:25:15  Date: 10/24/88
```

  The 8701 uses an internal battery powered clock circuit. The approximate current local time (in Elgin, IL) and date are set before the 8701 leaves the factory and may be changed by the user. A problem with the clock or battery would give a "CLOCK NOT SET" error message.

- The types and amounts of non-volatile, video and program memory available on the mainframe are checked. An 8701 with two megabytes of video memory installed would give the following display on the LCD:

```
2048k  GSP video memory
1024k  GSP program memory
```

  An 8701 with one megabyte of video memory installed would give the following display on the LCD:

```
1024k  GSP video memory
1024k  GSP program memory
```

- The 8701 checks to see if any optional I/O card has been installed. If a card is found, the LCD will show the following:

```
I/O card type n installed.
```

  Where " n " identifies the type of I/O card installed. If no cards are found the LCD will show the following:

```
No I/O card installed.
```

- The message "Self-test Complete." will appear for a few seconds. The LCD will then show the following message:

```
Insert 8701 boot disk in drive.
```

- The 8701 will then check to see if a valid boot disk is in the drive. If no disk is found, the message will blink until a disk is inserted. **If you are going to be inserting a boot disk that is being used for the very first time, the write protect tab on the disk must be set to write enable (window closed).** If an uninitialized disk or drive protector is found, it will be ejected and the power-up procedure will repeat. When a valid boot disk is found, The LCD will show the following as the boot software starts to load:

```
Booting ...
```

- The LCD message will then change to indicate the version of the user interface software being loaded. Additional messages will appear identifying the various portions of the operating system software being downloaded into the GSP.
- If no major faults were encountered, the LCD will show the following:

```
---------- Download Successful ----------
```

- If the disk you are using is being used for the very first time, the LCD will show the following:

```
Choose a video plug-in.
            BCF-125     ACF-250     ACF-400
```

  Press the "Select" button below the model number of the video plug-in installed. The generator may respond with additional dialog(s) to identify different versions of the same model plug-in.

  You will get one other dialog concerning the internal hardware configuration of the 8701 mainframe. The dialog will look like this:

```
Is there an EIA sync board installed ?
                          Yes         No
```

Mainframes that have the EIA Sync installed have a label on the back, near their AC power panel, indicating that "EIA Sync" has been installed. Select the appropriate choice from the LCD menu. The window will change to the following message:

```
Creating configuration file ...[          ]
```

The area between the two brackets will fill with black boxes as the configuration file is created and saved to disk.

The 8701 will then reset itself and go through the entire boot up procedure again, skipping the installation routine.

Caution: Attempting to operate your 8701 with improperly installed operating system software may cause it to appear to be broken (for example; outputs missing or at the wrong frequency). If you use the same disk on more than one 8701, you must make sure that the hardware is identical in both units. Otherwise you will have to re-install and reboot every time that you swap 8701's.

- The last step in the 8701's power-up procedure is to look for the default Format, formatØØ, on the disk and load it. If the format is found, the message "`Reading Format ...`" is shown on the LCD for a moment and the LCD will look like this:

```
[format00]
```

If the disk has been previously used, additional formats may appear in the list.

This completes the discussion on the 8701's power-up procedure. The "Error Messages" chapter of this manual provides additional information, and suggest possible cures, for each of the error messages mentioned.

Installing the Correct Operating System

The operating system software needs a way of knowing what video plug-in you have installed in the mainframe. The original disk, as supplied by Quantum Data, will automatically go through the installation procedure the very first time you use it. The configuration data is then saved on the disk. The data on the disk will remain valid as long as you use the disk with the same 8701 mainframe configuration and video plug-in type.

Caution: Attempting to operate your 8701 with improperly installed operating system software may cause it to appear to be broken (for example; outputs missing or at the wrong frequency). If you use the same disk on more than one 8701, you must make sure that the hardware is identical in both units. Otherwise you will have to re-install and reboot every time that you swap 8701's.

You normally match the operating system software to the plug-in by performing a "Macro Function" called "Install". The menu of available macro functions is brought to the the LCD by pressing the "Macros" button within the "Show" group of buttons. With the current version of the operating system software, pressing the "Macros" button gives you the following choices on the LCD:

```
  Eject       Clock      DiskCopy    DiskInit
 Install
```

Pressing "Select" button 5, below the word "Install", will first give you the following "warning" dialog on the LCD:

```
CAUTION! The Installation will reboot.
                                      Proceed
```

This message is to remind you of the fact that the 8701 will go through a complete power-up boot up when you finish the installation.

- If you do not wish to go through with the installation, press the "Cancel" button under the numeric keypad.
- If you wish to go through with installation procedure, press "Select" button 8, below the word "Proceed". A question and answer dialog will begin on the LCD. The first question to appear will look like this:

```
Choose a video plug-in.
              BCF-125      ACF-250      ACF-400
```

- Press the "Select" button below the model number of the video plug-in module that you have installed. The generator may respond with additional dialog(s) to identify different versions of the same model plug-in.
- You will get one other dialog concerning the internal hardware configuration of the 8701 mainframe. The dialog will look like this:

```
Is there an EIA sync board installed ?
                              Yes          No
```

Mainframes that have EIA Sync will have a label on the back, near the AC power panel, indicating that "EIA Sync" has been installed. Select the appropriate choice from the LCD menu. The window will change to the following message:

The area between the two brackets will fill with black boxes as the configuration file is created and saved to disk.

The 8701 will then reset and go through the entire boot up procedure.

Once you have completed configuring your 8701, you may go on to selecting a Format for loading and / or editing.

Selecting and Loading a Format

The set of parameters that describe the signal requirements for a particular display is called a "Format". Formats are stored on disk as MS-DOS compatible binary files with a file extension of ".fmt". A format has a name associated with it. The boot disk for the current software comes with a default "formatØØ" supplied. The current version of the operating system software allows you to save up to 105 files on a boot disk. New formats are normally created by loading an existing format, editing it and then saving the new format under a new name. As the last step in the power-up booting procedure, the 8701 loads "formatØØ". After power-up, the LCD will list up to eight formats. The display for a system disk, with no other formats on it, will look like this:

```
[format00]
```

The display for a disk with several other formats on it, may look like this:

```
[format00]  format01   format05   format22
 format16   format34   format25   format06
```

The formats will not necessarily be in any particular order. If there are more than eight (8) formats saved on a disk, the LED next to the knob will be lit. Rotating the knob will allow you to scroll up and down through the list of all of the available formats. Selecting and loading one of the formats on the list, merely requires that you to press the "Select" button adjacent to the desired format. For example, to select and load format 16 from the above list, you would press "Select" button 5. The LCD will display the message "Searching ..." as the 8701 starts searching through the disk. The message will change to "Reading Format ..." as the format is being loaded. The display would look like this after the format is loaded:

```
 format00   format01   format05   format22
[format16]  format34   format25   format06
```

The brackets indicate that the format has been selected. The selected (and loaded) format is edited by either pressing the "Edit" button to the right of the LCD or pressing any of the format parameter buttons.

Continuing with the earlier example; if you had pressed the "Line Rate" button, after selecting "format16" the LCD would now look something like this.

```
 format16    Raster
   Line       Rate    [ 63.500 ]     KHz
```

The line rate shown is an arbitrary value used as an example only. If you had pressed the "Edit" button, the LCD would display the last parameter that was selected prior to the format being loaded. The status of the outputs will be the same as when the format was last saved.

In the next section, you will find more information on how to change the values of a format's parameters.

Entering \ Changing a Format Parameter

In this section, we will change the value of a parameter using both the numeric keypad and the knob. The values shown in the examples are taken from the default format (formatØØ) supplied on the system boot disk. This section assumes that you have powered-up the 8701 and that you are now editing this format.

Figure 4-2 illustrates the overall concept of selecting a parameter and changing its value using both the keypad and knob.

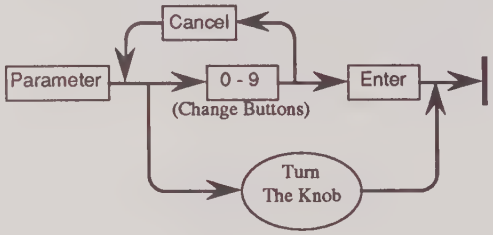


Figure 4-2
Parameter Entry Syntax Diagram

Many of the operations of the 8701 involve changing the value of a parameter that is displayed on the LCD. The following figure shows which Format parameters can be both read and changed:

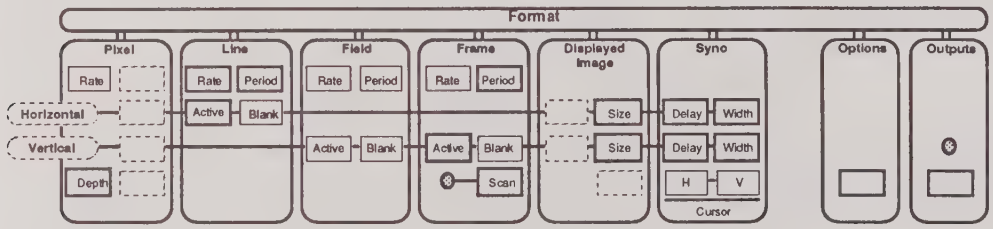


Figure 4-3 Format Parameter Read & Edit Buttons

A parameter is selected by pressing the button associated with that parameter. Once selected the name and current value of the parameter are displayed. For example, pressing the "Line Active" button causes the following to appear on the LCD:

```
format00     Raster      25.396      µS
  Line       Active   [  640   ]   Pixels
```

Many of the parameters display two values. The number at the lower right of the LCD shows the "machine" value of the parameter, while the number above it generally indicates the "time" value equivalent. The brackets around the machine value indicate that it is selected for changing. Machine values are preferred because they are not subject to rounding errors. The select brackets automatically appear around the parameter value that should be changed. In most cases, such as for "Line Active", the top value can be read but not changed. Pressing the top button will have no affect.

Two of the parameters,"Horizontal \ Displayed Image Size" and "Vertical \ Displayed Image Size" will let you change both the top and bottom numbers.

In some cases, changing the value of one parameter will cause the value of one or more other parameters to change. For example, the value of "Line Period" is defined as being equal to the sum of values for "Line Active" plus "Line Blank". The operating system software will always try to keep the equation in balance. The interrelationship between the format parameters is explained in the "Reference" chapter.

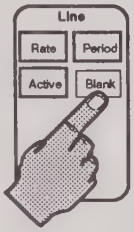
Numeric values may be entered using the numeric keypad in the "Change" area. The select brackets around the displayed value will become arrows as you start typing in a new value. The new value is not acted upon until you press the "Enter" button. Pressing the "Cancel" button at any time prior to pressing the "Enter" button will cause the previously entered value to be recalled. Pressing another parameter button after typing in, but not entering, a new value will cause the previously typed number to be ignored.

Note: With the outputs turned on, the 8701 will normally process each new value after the "Enter" button is pressed. If the new value results in a valid format, the 8701 will immediately update its outputs to match the new value. An invalid entry will cause the outputs to turn off and an error message to appear on the LCD. Parameter values entered with the outputs turned off are not checked for their validity. Only when the outputs are turned on, are the parameters checked. This feature permits you to make major changes in a Format without getting constant error messages.

Numeric values, in most cases, may also be incrementally increased or decreased from their current settings by using the knob in the "Change" area. The LED below the knob indicates that the knob is active. Format Option choices, which will be covered in detail in a later discussion, are also selected with the knob. The knob changes Format parameter values in real-time. With the outputs on, you can immediately see the affects of the new values on the target display as the knob is rotated.

Figure 4-4 goes through the necessary steps to adjust the value of the Line Blank parameter using the numeric keypad and knob. In the example, default formatØØ's setting of 6.349 microseconds (16Ø pixels) is changed to a desired value of 7.5 microseconds.

Step #1: Press the button labeled "Blank" in the "Line" sub-heading under "Format". The LCD will display the current value of line blank as shown below:



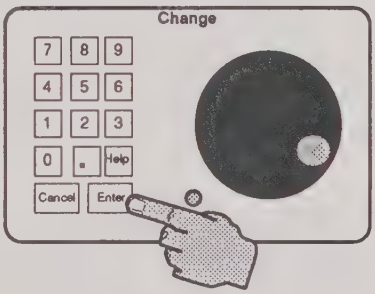

```
format00   Raster    6.349       µS
  Line     Blanking [  160   ]  Pixels
```

The brackets around the bottom number indicate that the number is selected for editing.

Step #2: You will need about a 25% increase. 200 pixels should be close. Type in this value using the numeric keypad.

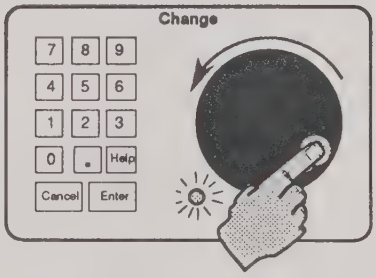
```
format    Raster    6.349       µS
  Line    Blanking →  200   ←  Pixels
```

Step #3 The LCD should now appear as shown above. The Format name will change to the word"format" to indicate that format you are using may no longer match the original version on the disk. The brackets become arrows as you start to type the number. You will note that the time, in microseconds, still remains at its original value. Press the "Enter" button. The LCD will then update to reflect the new values as shown below:




```
format    Raster    7.558       µS
  Line    Blanking [  200   ]  Pixels
```

Step #4: This is very close to the desired value of 7.5 microseconds. You will note that the LED next to the knob is lit. This indicates that the selected value may be also be changed using the knob. Try turning the knob counter- clockwise as you watch the display. You do not have to press the "Enter" button; the 8701 continuously updates the values in real-time as you turn the knob. You should be able to get to the values shown below:




```
format    Raster    7.500       µS
  Line    BlankH[  198   ]  Pixels
```

Figure 4-4 Changing a Parameter's Value using the Numeric Keypad and Knob

Entering Your Display's Specifications

This section discusses how to program the 8701 to operate your target display. Previous sections in this chapter have covered some of the terminology used as well as how to use the numeric keypad and knob to enter values. Powering up the 8701 and loading a Format have also been discussed in earlier sections. For the purposes of this discussion, the default format (31.5 KHz Line Rate) will be used as the starting format in the following example. We will be entering the parameters and signal options for a hypothetical high resolution (1280 x 1024) 63 KHz color monitor. You may wish to first go through this discussion using the values shown before using your own values. Figure 4-5 shows the overall concept entering format parameters and options.

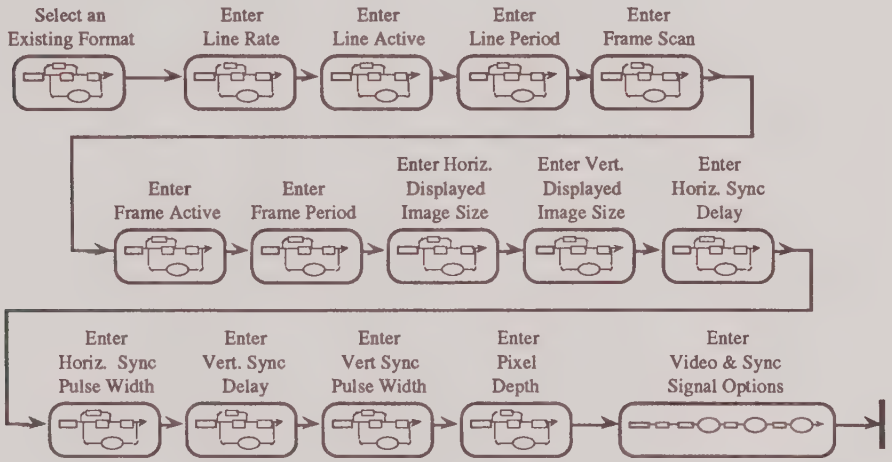


Figure 4-5 Format Entry Syntax Diagram

Due to the variety of displays that exist, the 8701 needs to know a certain amount of information about how the target display operates and the types of signals it requires. All of this information, as a group, is called a "Format". Figure 4-6 shows the Format section of the 8701's front panel. You will note that 15 of the buttons have a black outline around them. Thirteen (13) of these represent the minimum amount of information that the 8701 needs to know about the target display. The 14th button, "Options", lets you configure the generator's outputs to match the target display's inputs. The 15th button, "Outputs", turns the signal outputs on and off.

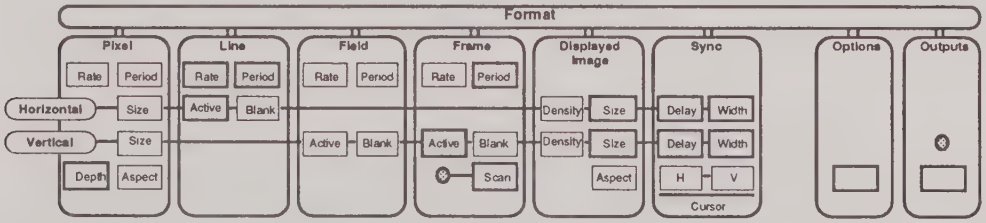


Figure 4-6 Format Buttons

Let's start by taking a look at the specification sheet for our hypothetical color monitor:

Hypothetical Displays, Inc. Technical Specifications:	**Model No. 123-456**		**19 inch Color Monitor**
Horizontal Resolution:	128Ø	dots	
Vertical Resolution:	1Ø24	lines	(non-interlaced)
Horizontal Scan Rate:	63.Ø	KHz	(+/- 25Ø Hz)
Vertical Scan Rate:	60	Hz	(+/- 2 Hz)
Horizontal Retrace Time:	3.ØØ	µSec	(max.)
Vertical Retrace Time:	4ØØ	µSec	(max.)
Horizontal Sync			
Signal Type:	Separate TTL input		(positive going pulse)
Front Porch:	Ø.6Ø	µSec	(nom.)
Pulse Width:	1.2Ø	µSec	(min.)
Vertical Sync			
Signal Type:	Separate TTL input		(positive going pulse)
Front Porch:	Ø	µSec	(nom.)
Pulse Width:	45.Ø	µSec	(min.)
Display Area Width:	14.ØØ	inches	
Display Area Height:	12.5Ø	inches	
Video Amplifiers			
Inputs	3 separate red, green and blue inputs 75Ω ea.		
Levels	Analog Ø to Ø.7 volt positive going		
Bandwidth	DC to 1ØØ	MHz	(max.)

Figure 4-7 Monitor Specification Sheet

Caution: If you plan to save the new version of the format you are editing, make sure that the write protect window of the disk is not write protected (window closed). Attempting to save a format to a disk that is write protected (window open) will result in an error message.

Start by selecting formatØØ for editing. We will enter values for the parameters whose buttons have black outlines. Since we will be entering an entirely new set of parameter values, the outputs should be turned off.

Note: You should leave the outputs turned off when you are making many changes to a format since certain combinations of old and new data will be invalid. With the outputs turned on, the 8701 will try to load each new parameter value into the signal generating circuitry after each entry. If the new value creates an invalid condition, the 8701 will turn its outputs off and give you an error message. With the outputs turned off, the 8701 will not check for invalid conditions until you attempt to turn the outputs back on.

Line Rate

Selecting the Line Rate parameter will display the following on the LCD:

```
format00    Raster
  Line       Rate    [ 31.500 ]    KHz
```

Enter the specification sheet horizontal scan rate value of 63 KHz. If the specification sheet for your display gives you a line period instead of a line rate, you will first have to calculate the line rate by taking the reciprocal of the line period. Note that the format identification on the top line of the LCD changes from "formatØØ" to "format". This indicates that the format you are currently working on is no longer identical to the contents of the originating format file on the disk.

Line Active

Selecting the Line Active parameter will display the following on the LCD:

```
format      Raster      12.698       µS
  Line      Active   [  640   ]    Pixels
```

Entering our specification sheet's Horizontal Resolution value of 128Ø dots will give the following on the LCD:

```
format      Raster      14.108       µS
  Line      Active   [  1280  ]    Pixels
```

You can ignore the 14.108 µSec value for now. It will most likely change when we enter some additional parameters.

Line Period

Selecting the Line Period parameter will display the following on the LCD:

```
format      Raster      15.873       µS
  Line      Period   [  1440  ]    Pixels
```

The Line Period, in pixels, is equal to the desired pixel rate divided by the Line Rate. Dividing the 1ØØ MHz maximum bandwidth of the display by 63 KHz gives us a result of 1587.3Ø2 pixels. This result should be rounded down to the nearest whole pixel. To insure that the format will work with any current video plug-in, the value should be further rounded to the nearest even number. Entering a value of 1586 pixels will leave the LCD looking like this:

```
format      Raster      15.873       µS
  Line      Period   [  1586  ]    Pixels
```

Selecting the Line Blank parameter will display the following on the LCD:

```
format      Raster       3.062       µS
  Line     Blanking  [   306   ]    Pixels
```

The value should be enough to allow testing the 3.ØØ micro-second specification for Horizontal Retrace Time.

Frame Scan

The Frame Scan parameter determines whether or not a format is interlaced. Selecting the Frame Scan parameter will display the following on the LCD:

format	Raster		non-	Intrlace
Frame	Scan	[	1]	Field

Since our specification calls for non-interlaced operation, we do not need to change this parameter. However, to keep our discussion of "Frame Scan" complete, you may wish to see how to select interlaced operation. The LCD, with Frame Scan set to 2 interlaced fields per frame, will look like this:

format	Raster			Intrlace
Frame	Scan	[	2]	Fields

Be sure that the value is returned to 1 Field before continuing with this discussion.

Note: The red LED to the left of the Frame Scan button will be lit whenever the 8701 is interlacing (for example; more than one field is being scanned in each frame).

Frame Active

Selecting the Frame Active parameter will display the following on the LCD:

format	Raster	7.619	mS
Frame	Active	[480]	Lines

Entering the Vertical Resolution specification value of 1Ø24 lines will change the LCD display to:

format	Raster	16.253	mS
Frame	Active	[1024]	Lines

Frame Period

Selecting the Frame Period parameter will display the following on the LCD:

format	Raster	8.333	mS
Frame	Period	[525]	Lines

The Frame Period, in lines, is equal to the Line Rate divided by the desired Frame Rate. The Frame Rate is equal to the vertical scan rate for non-interlaced formats and half (1/2) the vertical scan rate for interlaced formats. Dividing 63 KHz by 6Ø Hz gives us a result of exactly 1Ø5Ø lines. Entering this value will change the LCD display to:

format	Raster	16.666	mS
Frame	Period	[1050]	Lines

You may wish to see if this period gives us enough blanking time to allow for our monitor's vertical retrace time. Selecting the Field Blank parameter will display the following on the LCD:

format	Raster	0.412	mS
Field	Blanking	[26]	Lines

This value should be adequate to cover our 4ØØ microsecond (.4ØØ millisecond) Vertical Retrace Time spec.

Displayed Image Horizontal Size

Selecting the Displayed Image, Horizontal Size parameter (the upper of the two "Size" buttons, as identified by the "Horizontal" label at the far left) will display the following on the LCD:

format	Raster	381.000	mm
Display	H-Size	[15.000]	Inches

This is one of the few parameters that allow you to select and change either of the values shown. Since our specification deals in inches, we do not need to select the millimeter value. Entering our value of 14 inches will display the following on the LCD:

format	Raster	355.600	mm
Display	H-Size	[14.000]	Inches

Displayed Image Vertical Size

Selecting the Displayed Image, Vertical Size parameter (the lower of the two "Size" buttons, as identified by the "Vertical " label at the far left) will display the following on the LCD:

format	Raster	304.800	mm
Display	V-Size	[12.000]	Inches

This is one of the few parameters that allow you to select and change either of the values shown. Since our specification deals in inches, we do not need to select the millimeter value. Entering our value of 12.5 inches will display the following on the LCD:

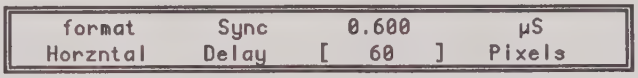
format	Raster	317.500	mm
Display	V-Size	[12.500]	Inches

Horizontal Sync Delay

Selecting the Horizontal Sync Delay parameter will display the following on the LCD:

format	Sync	0.400	µS
Horzntal	Delay	[40]	Pixels

We need to increase the current value of Ø.4ØØ microseconds by 5Ø% to reach our monitor's Horizontal Sync Front Porch specification of Ø.6Ø microseconds. Entering a value of 6Ø pixels will display the following on the LCD:



Horizontal Sync Width

Selecting the Horizontal Sync Width parameter will display the following on the LCD:

The 8701 uses pixels as the unit of measure for horizontal sync width. Fractional values occur due to the way the pulse is generated by the current version of the mainframe. The horizontal sync pulse width may only be changed in 2ØØ nanosecond (Ø.2 µS) steps. Entering a value, in pixels, that is not a multiple of 2ØØ nanoseconds will return the nearest valid pixel value. Changing the value by rotating the knob will automatically give you the required 2ØØ nanosecond steps. To enter our value of 1.2 microseconds, turn the knob counter-clockwise until the LCD looks like this:

Please note that most modern CRT displays will tolerate some variation in the width of the horizontal sync pulse since their horizontal sync circuits are only sensitive to the leading edge of the sync pulse.

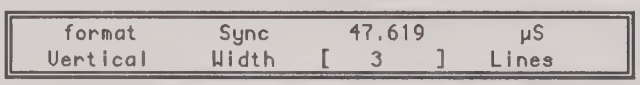
Vertical Sync Delay

Selecting the Vertical Sync Delay parameter will display the following on the LCD:

Entering a value of Ø lines will display the desired results, as shown:

Vertical Sync Width

Selecting the Vertical Sync Width parameter will display the following on the LCD:



The 8701 uses scan lines as the unit of measure for Vertical Sync Width. The resolution is single line increments. The current value is quite close to our specification for a minimum vertical sync pulse width of 45 microseconds. Rocking the knob back and forth will verify that it is the closest available value.

Pixel Depth

Selecting the Pixel Depth parameter will display the following on the LCD:

format	Raster	256	Colors
Pixel	Depth	[8]	Bits

The current version of the operating system software supports settings of 1, 2, 4 and 8 bits per pixel. Unless you have a specific need to use a certain number of bits, use the highest value that will work without giving you an error message. A value greater than two bits-per-pixel is required by most of the built-in images.

We are now done entering the monitor's timing requirements and display size into the 8701. You may have noted that we did not enter two of the rates shown on the specification sheet, Vertical Scan Rate and maximum Video Bandwidth. For a given line rate, the 8701 will automatically calculate the required field and pixel rates. These calculations are based on the values of other parameters that were entered.

Note: The current version of operating system software allows you to enter either a pixel, a line, a field or a frame rate. Only one of these rates has to be entered. The last rate that is entered automatically becomes the "reference" rate. The reference rate is used by the 8701 to calculate the other rates. The default format uses line rate as the reference. We strongly urge you to use the line rate as your reference rate. Future versions of the operating system may offer this as your only alternative.

For a given line rate, the pixel rate is calculated by multiplying the line rate by the line period (in pixels). Selecting the "Pixel Rate" parameter will show you that it has a value of 99.918 MHz, which is just within the monitor's video bandwidth specification.

For a given line rate, the field rate is calculated by dividing the line rate by the field period (in lines). Selecting the "Field Rate" parameter will show you that it has a value of 6Ø.ØØØ Hz, as called for by the monitor specification sheet.

We will now enter the types of output signals required by your monitor.

Options

The parameters that are selected for editing, when the "Options" button is pressed, deal with setting up the 8701's output signals to match your display's requirement. The appendix at the end of this manual contains information on all the the video plug-in modules that are currently available. This information will tell you which option choices are supported by a particular type of plug-in.

Pressing the "Options" button will give you the following options menu on the LCD:

DVSignal	DSSignal	AVSignal
DVOutput	DSOutput	AVOutput

The top three (3) selections, "DVSignal", "DSSignal" and "AVSignal", are referred to as high level or "Bank" selections. Selecting one of these will allow you to set up multiple video outputs with just a few keystrokes. The bottom three (3) selections allow you to view and change the output configurations on an individual signal basis for both video and sync.

Note: Attempting to select a signal configuration that is not supported by the hardware configuration you are using will result in one or more error messages. A format that is valid for one type of hardware configuration may not be valid for a different configuration. Whenever possible, you should configure the sync outputs using the high level "DSSignal" selection.

Trying to describe all of the choices for each of the selections is not a simple task. Instead, we will go through step-by-step procedures for the more common types of displays that you would be connecting to the 8701's outputs. The types of displays the will be discussed are:

- Color Analog Video with Separate Digital Sync(s) (See page 41)
- Color Analog Video Combined with Composite Sync (On Green) (See page 43)
- Monochrome Analog Video with Separate Digital Sync(s) (See page 45)
- Monochrome Analog Video Combined with Composite Sync (See page 48)
- Color Digital Video with Separate Digital Sync(s) (See page 50)
- Monochrome Digital Video with Separate Digital Sync(s) (See page 53)

The procedures will be found under matching boldface headings on the following pages. Find the heading that best describes your target display and then follow the procedure under that heading. For those of you entering a format for our hypothetical display, follow the procedure under "Color Analog Video with Separate Digital Sync(s)". Information on setting up the signal options for less common type of displays will be found in the section dealing with "Formats" in the "Reference" chapter. The section contains a full explanation of the options menu and all of the choices that are available. If have any questions on how to connect your particular display, contact Quantum Data for further assistance.

Color Analog Video with Separate Digital Sync(s)

This type of color display can be identified by the four (4) or five (5) separate signal lines required to drive it and by the fact that it can display an almost limitless range of color hues and intensities.

The first step, after pressing the "Options" button, is to select "AVSignal" (Analog Video Signal) from the main options menu. The "AVSignal" sub-menu for the default format looks like this:

format	Options		
AVSignal	RGB	Gate=On	Sync=ind

If you are not working with the original default format, the selections above "Select" buttons numbered 6, 7 and 8 may have different settings. The "AVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
AVSignal	RGB	Gate=On	Sync=Off

The selections are changed by pressing the "Select" button adjacent to the item you wish to change and then turning the knob back and forth until the correct setting appears.

Note: Attempting to select an analog video configuration that is not supported by the video plug-in module you are using will result in an error message.

Press the "Options" button (The button with "Options" printed on it; not the "Select" button adjacent to the word "Options" on the LCD) to take you back to the main options menu and then select "DSSignal" (Digital Sync Signal). The "DSSignal" sub-menu for the default format looks like this:

format	Options		
DSSignal	Void	Gate=ind	True=ind

If you are not working with the original default format, the selections above "Select" buttons numbered 5, 6, 7 and 8 may have different settings.

If your target display requires separate horizontal and vertical synchronization pulses, the "DSSignal" settings for the selection above button number 6 should be changed to match the one in the following sub-menu:.

format	Options		
DSSignal	HS & VS	Gate=ind	True=ind

- If your target display requires the horizontal and vertical sync pulses to have the same polarity, you can set it from the "DSSignal" sub-menu. If both pulses need to be positive going, the "True= " setting above button 8 should be set to "True=H". If both pulses need to be negative going, the "True= " setting above button 8 should be set to "True=L".
- If your target display requires that the horizontal and vertical sync pulses have different polarities, you will need to first press the "Options" button to get you back to the main options menu. Then select "DSOutput" (Digital Sync Outputs). A typical "DSOutput" sub-menu looks like this:

format	Options		
[D-Sync0]	HS	Gate=Off	True=H

- This is one of four (4) sub-menus under "DSOutput". There is a separate sub-menu for each of the sync channel outputs. By having the sync channel selected, as shown, and turning the knob, you can scroll through the sub-menus. Find the sync channel sub-menu that has "HS" (Horizontal Sync) above button 6. If your previous "DSSignal" bank selection automatically chose sync channel 1 for horizontal sync, the sub-menu would look something like this:

format	Options		
[D-Sync0]	HS	Gate=Off	True=H

- Set the "Gate= " selection to "Gate=ON". If the pulse needs to be positive going, the "True= " setting above button 8 should be set to "True=H". If the pulse needs to be negative going, the "True= " setting above button 8 should be set to "True=L".
- Find the sync channel sub-menu that has "VS" (Vertical Sync) above button 6. If your previous "DSSignal" bank selection automatically chose sync channel 1 for vertical sync, the sub-menu would look something like this:

format	Options		
[D-Sync1]	VS	Gate=Off	True=H

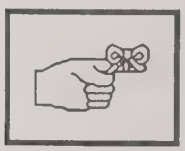
- Set the "Gate= " selection to "Gate=ON". If the pulse needs to be positive going, the "True= " setting above button 8 should be set to "True=H". If the pulse needs to be negative going, the "True= " setting above button 8 should be set to "True=L".

If your target display requires a single digital synchronization signal (Horizontal and Vertical sync combined), you will first need to determine if your display requires that the combined sync include serration and / or equalization pulses. **In order to add these additional pulses, the 8701 mainframe must have "EIA-Sync" hardware installed.** The specifications of "EIA-Sync" will be found in this manual's appendix. Information on programming the "DSSignal" choices for serrations and equalizers will also be found in the specifications.

If your target display requires a simple (signals OR'ed together) combination of horizontal and vertical synchronization pulses, The "DSSignal" setting for the selection above button number 6 should be changed to match the one in the following sub-menu:

format	Options		
DSSignal	CS-ORed	Gate=ind	True=ind

If the target display requires that the combined sync pulse be positive going, the "True= " setting should be set to "True=H". If the target display requires that the combined sync pulse be negative going, the "True= " setting should be set to "True=L".



Note: Attempting to select a digital sync configuration that is not supported by the hardware configuration you are using will result in an error message.

Color Analog Video Combined with Composite Sync (On Green)

This type of color display can be identified by the three (3) separate signal lines required to drive it and by the fact that it can display an almost limitless range of color hues and intensities.

You will first need to determine if your display requires that the composite sync include serration and / or equalization pulses. **In order to add these additional pulses, the 8701 mainframe must have "EIA-Sync" hardware installed.** The specifications of "EIA-Sync" will be found in this manual's appendix. Information on programming the serrations and equalizers will also be found in the specifications.

The first step, after pressing the "Options" button, is to select "AVSignal" (Analog Video Signal) from the main options menu. The "AVSignal" sub-menu for the default format looks like this:

format	Options		
AVSignal	RGB	Gate=On	Sync=ind

If you are not working with the original default format, the selections above "Select" buttons number 6, 7 and 8 may have different settings. The brackets will be around one of these selections. The "AVSignal" settings for the selections above buttons number 6 and 7 should be changed to match the ones in the following sub-menu:

format	Options		
AVSignal	RGB	Gate=On	Sync=ind

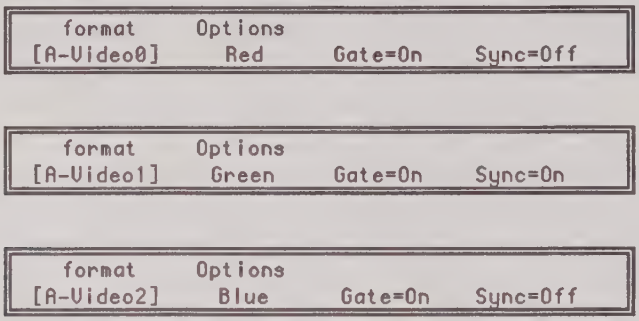
The selections are changed by pressing the "Select" button adjacent to the item you wish to change and then turning the knob back and forth until the correct setting appears. The setting for the selection above button 8 does not matter at this time.

Note: Attempting to select an analog video configuration that is not supported by the video plug-in that you are using will result in an error message.

Press the "Options" button (The button with "Options" printed on it; not the "Select" button adjacent to the word "Options" on the LCD) to take you back to the main options menu and then select "AVOutput" (Analog Video Outputs). An "AVOutput" sub-menu for the default format looks like this:

format	Options		
[A-Video0]	Red	Gate=On	Sync=Off

If you are not working with the original default format, the selections above "Select" buttons numbered 5, 6, 7 and 8 may have different settings. The current version of the operating system software allows you to enter unique settings for up to three (3) analog video channels (numbered Ø through 2). You should use the automatic settings performed by your "AVSignal" selection. The settings for a particular channel can be found by pressing "Select" button 5, adjacent to the channel number, and turning the knob until the desired channel number appears on the LCD. If your target display requires that a composite synchronization signal be added to the green video signal, find the sub-menu that has "Green" above button 6. The "Sync=Off" and the "Sync=" setting for that channel should be set to "Sync=On". Typical sub-menus for the three channels, with sync on green, might look like this:



If the target display requires that composite sync be added to a different color besides green, the "Sync=On" setting for the green channel should be set to "Sync=Off" and the "Sync=Off" setting for the desired color channel should be set to "Sync=On".

Monochrome Analog Video with Separate Digital Sync(s)

This type of monochrome display can be identified by the two (2) or three (3) separate signal lines required to drive it and by the fact that it can display an almost limitless range of gray levels (assuming the picture tube has a white phosphor).

The first step, after pressing the "Options" button, is to select "AVSignal" (Analog Video Signal) from the main options menu. The "AVSignal" sub-menu for the default format looks like this:

format	Options		
AVSignal	RGB	Gate=On	Sync=ind

If you are not working with the original default format, the selections above "Select" buttons numbered 6, 7 and 8 may have different settings. The brackets will be around one of these selections. The "AVSignal" settings for the selections above buttons 6, 7 and 8 should be changed to match the ones in the following sub-menu:

format	Options		
AVSignal	B/W	Gate=On	Sync=Off

The selections are changed by pressing the "Select" button adjacent to the item you wish to change and then turning the knob back and forth until the correct setting appears.

Note: Attempting to select an analog video configuration that is not supported by the video plug-in you are using will result in an error message.

Press the "Options" button (The button with "Options" printed on it; not the "Select" button adjacent to the word "Options" on the LCD) to take you back to the main options menu and then select "DSSignal" (Digital Sync Signal). The "DSSignal" sub-menu for the default format looks like this:

format	Options		
DSSignal	Void	Gate=ind	True=ind

If you are not working with the original default format, the selections above "Select" buttons numbered 5, 6, 7 and 8 may have different settings.

If your target display requires separate horizontal and vertical synchronization pulses, the "DSSignal" settings for the selection above button number 6 should be changed to match the one in the following sub-menu:.

format	Options		
DSSignal	HS & VS	Gate=ind	True=ind

- If your target display requires that the horizontal and vertical sync pulses have the same polarity, you can set it from the "DSSignal" sub-menu. If both pulses need to be positive going, the "True= " setting above button 8 should be set to "True=H". If both pulses need to be negative going, the "True= " setting above button 8 should be set to "True=L".
- If your target display requires that the horizontal and vertical sync pulses have different polarities, you will need to first press the "Options" button

to get you back to the main options menu. Then select "DSOutput" (Digital Sync Outputs). A typical "DSOutput" sub-menu looks like this:

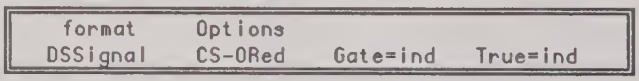
- This is one of four (4) sub-menus that are under "DSOutput". There is a separate sub-menu for each of the sync channel outputs. By having the sync channel selected, as shown, and turning the knob, you can scroll through the sub-menus. Find the sync channel sub-menu that has "HS" (Horizontal Sync) above button 6. If your previous "DSSignal" bank selection automatically chose sync channel 1 for horizontal sync, the sub-menu would look something like this:

- Set the "Gate= " selection to "Gate=ON". If the pulse needs to be positive going, the "True= " setting above button 8 should be set to "True=H". If the pulse needs to be negative going, the "True= " setting above button 8 should be set to "True=L".
- Find the sync channel sub-menu that has "VS" (Vertical Sync) above button 6. If your previous "DSSignal" bank selection automatically chose sync channel 1 for vertical sync, the sub-menu would look something like this:

- Set the "Gate= " selection to "Gate=ON". If the pulse needs to be positive going, the "True= " setting above button 8 should be set to "True=H". If the pulse needs to be negative going, the "True= " setting above button 8 should be set to "True=L".

If your target display requires a single digital synchronization signal (Horizontal and Vertical sync combined), you will first need to determine if your display requires that the combined sync include serration and / or equalization pulses. **In order to add these additional pulses, the 8701 mainframe must have the optional "EIA-Sync" hardware installed.** The specifications of the "EIA-Sync" option will be found in this manual's appendix. Information on programming the "DSSignal" choices for serrations and equalizers will also be found in the specifications.

If your target display requires a simple (signals OR'ed together) combination of horizontal and vertical synchronization pulses, the "DSSignal" setting for the selection above button number 6 should be changed to match the one in the following sub-menu:.



If the target display requires that the combined sync pulse be positive going, the "True= " setting should be set to "True=H". If the target display requires that the combined sync pulse be negative going, the "True= " setting should be set to "True=L".

Note: Attempting to select a digital sync configuration that is not supported by the hardware configuration you are using will result in an error message.

Monochrome Analog Video Combined with Composite Sync

This type of monochrome display can be identified by the single signal line required to drive it and by the fact that it can display an almost limitless range of shades of gray (assuming the picture tube has a white phosphor).

You will first need to determine if your display requires that the composite sync include serration and / or equalization pulses. **In order to add these additional pulses, the 8701 mainframe must have "EIA-Sync" hardware installed.** The specifications of the "EIA-Sync" option will be found in this manual's appendix. Information on programming the serrations and equalizers will also be found in the specifications.

The first step, after pressing the "Options" button, is to select "AVSignal" (Analog Video Signal) from the main options menu. The "AVSignal" sub-menu for the default format looks like this:

format	Options		
AVSignal	RGB	Gate=On	Sync=Ind

If you are not working with the original default format, the selections above "Select" buttons number 6, 7 and 8 may have different settings. The brackets will be around one of these selections. The "AVSignal" settings for the selections above buttons number 6, 7 and 8 should be changed to match the ones in the following sub-menu:

format	Options		
AVSignal	B/W	[Gate=On]	Sync=On

The selections are changed by pressing the "Select" button adjacent to the item you wish to change and then turning the knob back and forth until the correct setting appears.

Note: Attempting to select an analog video configuration that is not supported by the video plug-in you are using will result in an error message.

Press the "Options" button (The button with "Options" printed on it; not the "Select" button adjacent to the word "Options" on the LCD) to take you back to the main options menu and then select "AVOutput" (Analog Video Outputs). A typical "AVOutput" sub-menu looks like this:

format	Options		
[A-Video0]	Red	Gate=On	Sync=Off

If you are not working with the original default format, the selections above "Select" buttons numbered 5, 6, 7 and 8 may have different settings. The current version of the operating system software allows you to enter unique settings for up to three (3) analog video channels (numbered Ø through 2). If you selected "B/W" for the "AVSignal" type, the sub-menus for the three channels should look like the LCD windows as shown:

In this particular case, all three analog video channels will generate the exact same signal. To maintain compatibility with future software releases, you should use analog video channel 1 to drive the target display.

Color Digital Video with Separate Digital Sync(s)

This type of color display can be identified by the four (4) through ten (1Ø) separate signal lines required to drive it and by the fact that it can display a specified range of color hues and intensities. A simple display may only show up to eight (8) colors at a time. A display with more inputs may be capable of displaying 16, 64 or even 256 colors at one time.

The first step, after pressing the "Options" button, is to select "DVSignal" (Digital Video Signal) from the main options menu. The "DVSignal" sub-menu for the default format looks like this:

format	Options		
DVSignal	Void	Gate=On	True=H

If you are not working with the original default format, the selections above "Select" buttons numbered 6, 7 and 8 may have different settings. The settings of the selections are changed by pressing the "Select" button adjacent to the item you wish to change and then turning the knob back and forth until the correct setting appears.

The current version of the operating system software supports four (4) different types of digital color displays. Use the "DVSignal" setting that matches your target display description. The settings shown apply to displays that use a high logic level to indicate active video. If your target display uses a low logic level for active video, change the "True=H" setting to "True=L"

- If the target display has three (3) digital video inputs (**RGB**) and can show eight (8) different colors at one time, the "DVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
DVSignal	RGB	Gate=On	True=H

- If the target display has four (4) video inputs (**RGBI**) and can show sixteen (16) different colors at one time, the "DVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
DVSignal	RGBI	Gate=On	True=H

- If the target display has six (6) video inputs (**RrGgBb**) and that can show sixty four (64) different colors at one time, the "DVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
DVSignal	RrGgBb	Gate=On	True=H

- If the target display has eight (8) video inputs (**RrGgBbIi**) and can show 256 different colors at one time, the "DVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
DVSignal	RrGgBbIi	Gate=On	True=H

Note: Attempting to select a digital video configuration that is not supported by the hardware configuration you are using will result in an error message.

Press the "Options" button (The button with "Options" printed on it; not the "Select" button adjacent to the word "Options" on the LCD) to take you back to the main options menu and then select "DSSignal" (Digital Sync Signal). The "DSSignal" sub-menu for the default format looks like this:

format	Options		
DSSignal	Void	Gate=ind	True=ind

If you are not working with the original default format, the selections above "Select" buttons numbered 5, 6, 7 and 8 may have different settings.

If your target display requires separate horizontal and vertical synchronization pulses, the "DSSignal" settings for the selection above button number 6 should be changed to match the one in the following sub-menu:.

format	Options		
DSSignal	HS & VS	Gate=ind	True=ind

- If your target display requires that the horizontal and vertical sync pulses have the same polarity, you can set it from the "DSSignal" sub-menu. If both pulses need to be positive going, the "True= " setting above button 8 should be set to "True=H". If both pulses need to be negative going, the "True= " setting above button 8 should be set to "True=L".
- If your target display requires that the horizontal and vertical sync pulses have different polarities, you will need to first press the "Options" button to get you back to the main options menu. Then select "DSOutput" (Digital Sync Outputs). A typical "DSOutput" sub-menu looks like this:

format	Options		
[D-Sync0]	HS	Gate=Off	True=H

- This is one of four (4) sub-menus under "DSOutput". There is a separate sub-menu for each of the sync channel outputs. By having the sync channel selected, as shown, and turning the knob, you can scroll through the sub-menus. Find the sync channel sub-menu that has "HS" (Horizontal Sync) above button 6. If your previous "DSSignal" bank selection automatically chose sync channel 1 for horizontal sync, the sub-menu would look something like this:

format	Options		
[D-Sync0]	HS	Gate=Off	True=H

- Set the "Gate= " selection to "Gate=ON". If the pulse needs to be positive going, the "True= " setting above button 8 should be set to "True=H". If the pulse needs to be negative going, the "True= " setting above button 8 should be set to "True=L".
- Find the sync channel sub-menu that has "VS" (Vertical Sync) above button 6. If your previous "DSSignal" bank selection automatically chose

sync channel 1 for vertical sync, the sub-menu would look something like this:

format	Options		
[D-Sync1]	VS	Gate=Off	True=H

- Set the "Gate= " selection to "Gate=ON". If the pulse needs to be positive going, the "True= " setting above button 8 should be set to "True=H". If the pulse needs to be negative going, the "True= " setting above button 8 should be set to "True=L".

If your target display requires a single digital synchronization signal (Horizontal and Vertical sync combined), you will first need to determine if your display requires that the combined sync include serration and / or equalization pulses. **In order to add these additional pulses, the 8701 mainframe must have "EIA-Sync" hardware installed.** The specifications of "EIA-Sync" will be found in this manual's appendix. Information on programming the "DSSignal" choices for serrations and equalizers will also be found in the specifications.

If your target display requires a simple (signals OR'ed together) combination of horizontal and vertical synchronization pulses, The "DSSignal" setting for the selection above button number 6 should be changed to match the one in the following sub-menu:.

format	Options		
DSSignal	CS-ORed	Gate=ind	True=ind

If the target display requires that the combined sync pulse be positive going, the "True= " setting should be set to "True=H". If the target display requires that the combined sync pulse be negative going, the "True= " setting should be set to "True=L".

Note: Attempting to select a digital sync configuration that is not supported by the hardware configuration you are using will result in an error message.

Monochrome Digital Video with Separate Digital Sync(s)

This type of monochrome display can be identified by the two (2) through ten (1Ø) separate signal lines required to drive it and by the fact that it can display a specified number shades of gray (assuming the picture tube has a white phosphor). A simple, single video input display, will only show each pixel location as being either full ON or full OFF. A display with more inputs (and its own built-in Digital to Analog converter) may be capable of displaying 4, 16 or even 256 shades at one time.

The first step, after pressing the "Options" button, is to select "DVSignal" (Digital Video Signal) from the main options menu. The "DVSignal" sub-menu for the default format looks like this:

format	Options		
DVSignal	Void	Gate=On	True=H

If you are not working with the original default format, the selections above "Select" buttons numbered 6, 7 and 8 may have different settings. The brackets will be around one of these selections. The settings of the selections are changed by pressing the "Select" button adjacent to the item you wish to change and then turning the knob back and forth until the correct setting appears.

The current version of the operating system software supports four (4) different types of digital monochrome displays. Use the "DVSignal" setting that matches your target display description. The settings shown apply to displays that use a high logic level to indicate active video. If your target display uses a low logic level for active video, change the "True=H" setting to "True=L"

- If the target display has one (1) digital video input, the "DVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
DVSignal	B/W-1Bit	Gate=On	True=H

- If the target display has two (2) video inputs and can show four (4) shades of gray at one time, the "DVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
DVSignal	B/W-2Bit	Gate=On	True=H

- If the target display has four (4) video inputs and can show sixteen (16) shades of gray at one time, the "DVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
DVSignal	B/W-4Bit	Gate=On	True=H

- If the target display has eight (8) video inputs and can show 256 shades of gray at one time, the "DVSignal" settings for the selections should be changed to match the ones in the following sub-menu:

format	Options		
DVSignal	B/W-8Bit	Gate=On	True=H

Note: Attempting to select a digital video configuration that is not supported by the hardware configuration you are using will result in an error message.

Press the "Options" button (The button with "Options" printed on it; not the "Select" button adjacent to the word "Options" on the LCD) to take you back to the main options menu and then select "DSSignal" (Digital Sync Signal). The "DSSignal" sub-menu for the default format looks like this:

format	Options		
DSSignal	Void	Gate=ind	True=ind

If you are not working with the original default format, the selections above "Select" buttons numbered 5, 6, 7 and 8 may have different settings.

If your target display requires separate horizontal and vertical synchronization pulses, The "DSSignal" settings for the selection above button number 6 should be changed to match the one in the following sub-menu:.

format	Options		
DSSignal	HS & VS	Gate=ind	True=ind

- If your target display requires that the horizontal and vertical sync pulses have the same polarity, you can set it from the "DSSignal" sub-menu. If both pulses need to be positive going, the "True= " setting above button 8 should be set to "True=H". If both pulses need to be negative going, the "True= " setting above button 8 should be set to "True=L".
- If your target display requires that the horizontal and vertical sync pulses have different polarities, you will need to first press the "Options" button to get you back to the main options menu. Then select "DSOutput" (Digital Sync Outputs). A typical "DSOutput" sub-menu looks like this:

format	Options		
[D-Sync0]	HS	Gate=Off	True=H

- This is one of four (4) sub-menus under "DSOutput". There is a separate sub-menu for each of the sync channel outputs. By having the sync channel selected, as shown, and turning the knob, you can scroll through the sub-menus. Find the sync channel sub-menu that has "HS" (Horizontal Sync) above button 6. If your previous "DSSignal" bank selection automatically chose sync channel 1 for horizontal sync, the sub-menu would look something like this:

format	Options		
[D-Sync0]	HS	Gate=Off	True=H

- Set the "Gate= " selection to "Gate=ON". If the pulse needs to be positive going, the "True= " setting above button 8 should be set to "True=H". If the pulse needs to be negative going, the "True= " setting above button 8 should be set to "True=L".

- Find the sync channel sub-menu that has "VS" (Vertical Sync) above button 6. If your previous "DSSignal" bank selection automatically chose sync channel 1 for vertical sync, the sub-menu would look something like this:

format	Options		
[D-Sync1]	VS	Gate=Off	True=H

- Set the "Gate= " selection to "Gate=ON". If the pulse needs to be positive going, the "True= " setting above button 8 should be set to "True=H". If the pulse needs to be negative going, the "True= " setting above button 8 should be set to "True=L".

If your target display requires a single digital synchronization signal (Horizontal and Vertical sync combined), you will first need to determine if your display requires that the combined sync include serration and / or equalization pulses. **In order to add these additional pulses, the 8701 mainframe must have "EIA-Sync" hardware installed.** The specifications of "EIA-Sync" will be found in this manual's appendix. Information on programming the "DSSignal" choices for serrations and equalizers will also be found in the specifications.

If your target display requires a simple (signals OR'ed together) combination of horizontal and vertical synchronization pulses, The "DSSignal" setting for the selection above button number 6 should be changed to match the one in the following sub-menu:.

format	Options		
DSSignal	CS-ORed	Gate=ind	True=ind

If the target display requires that the combined sync pulse be positive going, the "True= " setting should be set to "True=H". If the target display requires that the combined sync pulse be negative going, the "True= " setting should be set to "True=L".

Note: Attempting to select a digital sync configuration that is not supported by the hardware configuration you are using will result in an error message.

Drawing the Built-in Images

The discussion in this section deals with going through some of the various image menus and sub-menus that are available when you press the "Images" button in the "Show" group. These menus let you draw all of the images included with the operating system software. In order to follow this discussion, you should have your display connected to the 8701's outputs. An analog color display will let you see all of the images. The 8701 should be powered up and have a suitable format loaded.

Note: Attempting to select an Instant Expert image that is not supported by the format you are using will result in an error message.

The current version of the operating system software includes a set of over sixty (60) self-scaling "Instant-Expert" test images. These images cover a wide variety of tests that may be used to check the performance of your displays. "Demo" images, including animation, are also provided with the current software. These demo images may be used to demonstrate your displays to customers or for running your displays at trade shows. Some of the "Demo" choices continuously cycle through groups of images. We will not discuss each of the images in detail here. TheBuilt-In Images chapter describes all of the "Instant-Expert" images and tells you how they may be used.

Pressing the "Images" button in the "Show" group, will display the following menu on the LCD:

DEMO	GENERAL	SPECIAL	CUSTOM
SETUP	GEOMETRY	COLOR	FINAL

This is the top level or "main" images menu. In general, all image menu items written in all CAPITAL LETTERS indicate that selecting one of those items will call up another menu instead of drawing an image. Selecting "CUSTOM" calls up a directory of user-created custom images. The section on "Creating Custom Images Using Image Files" deals with how to make your own images. Continuing our discussion; selecting "GENERAL" will give the following menu:

timing	smpte	text	briggs

Selecting "smpte" will draw the SMPTE RP-133 test pattern. When the image is completely drawn, brackets will appear around the menu selection, as shown:

timing	[smpte]	text	briggs

Selecting "text" will draw a document made up of random phrases. The document will have white letters on a black background. When the image is drawn, pressing the "Edit" button to the right of the LCD will give you the following sub-menu on the LCD:

negative

Selecting "negative" will change the displayed image to black letters on a white background. Repeatedly pressing this button will toggle the character and background colors. Pressing the "Done" button to the right of the LCD return you to the previous "GENERAL" menu. Certain other Instant-Expert images will are invertible.

Go back to the main menu by pressing the "Done" button.

Note: Pressing the "Images" button, at any time will take you to the current images menu. Pressing the "Images" button a second time, with an image menu showing on the LCD, will redraw the last selected "Instant-Expert" image. The redraw feature is helpful when you are making format changes that distort the existing image.

Selecting "GEOMETRY" from the main images menu will give the following menu:

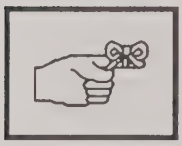
u-center	size	linear	parallel
converge	pin&brl	trap	dotGrid

Selecting "converge" will draw a white convergence test image on a black background. When the image is done drawing, pressing the "Edit" button will give you the following sub-menu on the LCD:

+Red	+Green	+Blue	White
-Red	-Green	-Blue	Dots=On

The choices in this sub-menu let you change the color of the pattern by selecting any combination of the three (3) primaries. You can also select a single primary. (You may be curious as to how convergence can be checked with only one primary color enabled. Computerized vision systems are available for the testing and alignment of CRT displays. By drawing the image a single primary at a time, the vision system can digitize the images using a monochrome camera without color filters. The position data for all three images can then be compared to calculate the amount of mis-convergence between each primary.) Selecting "+Red" will change the pattern to red lines and dots. Selecting "-Red" will change the pattern to cyan (green and blue combined) lines and dots. Certain other "Instant-Expert" images will allow you to change colors and control whether or not single pixel dots are added to the image.

This ends our discussion of drawing the built-in images and the various types of menus and sub-menus used to draw the images. You may wish to spend some additional time selecting through the various menus to become more familiar with the available images. The Built-In Images chapter has detailed information on each of the images, including information on attributes that may be edited.



Note: Attempting to edit an image that does not have any user-changeable attributes will result in an error message. If you get such an error message, press the "Select" button next to the label "Continue" to return to the Image menu. The Image Tree diagram in the appendices shows which images have editable attributes.

Creating Custom Images Using Image Files

The discussion in this section deals with creating simple user-defined images on the unit under test. The images may be saved on disk as Image files, having a file extension of ".img". An image may consist of any combination of dots, lines, boxes, ovals, grids, grills and characters. Individual boxes and ovals can be drawn as outlines or filled solids. Edge and center markers are also available. Each individual item can be drawn in any saturated combination of primary colors or one of ten (10) pre-defined shades of gray, including black. Almost all of the items self scale to the current Format that you have loaded. For example, once you draw a box that is half the width of your display, it will always be drawn at the same relative width for any Format. Figure 4-8 shows the overall concept of editing a custom image. The path that you would normally follow to create a new image is hi-lighted.

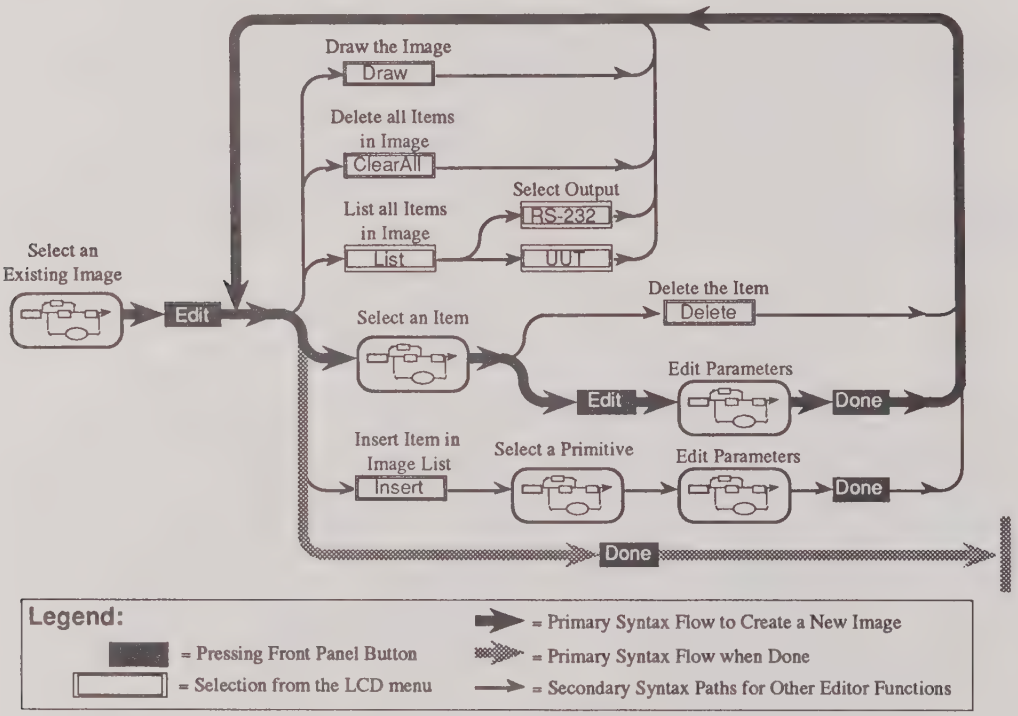


Figure 4-8 Custom Image Syntax Diagram

In order to follow this discussion, you should have your display connected to the 8701's outputs. An analog color display will let you see all of the possibilities. The 8701 should be powered up and have a suitable format loaded. The numbers used in the discussion relate to an analog color Format that has 640 active pixels on a line and 480 active line per frame. The Format has a pixel depth of 8 bits-per-pixel. To show how some of the drawing primitives work, we will go through all of the steps it takes to draw a sample image. There is a section in the "Reference" chapter that covers custom images in more detail.

Custom images are accessed through the main images menu. Pressing the "Images" button in the "Show" group, will display the main images menu on the LCD:

DEMO	GENERAL	SPECIAL	CUSTOM
SETUP	GEOMETRY	COLOR	FINAL

Selecting "CUSTOM", by pressing "Select" button 4, will call up a sub-menu of all available custom images that are on the disk. The boot disk for the current software comes with a default Image file named "newImage". Selecting "CUSTOM" with a disk that has no other Image files, except the default, on it will give you the following menu on the LCD:

[newimage]

If the disk has been previously used, additional Image files may be listed. New custom images are normally created by loading an existing custom image, editing it and then saving it under a new name. If it isn't currently selected, select "newimage" from the custom images sub-menu. Any previously drawn image on the unit under test will be cleared. Press the "Edit" button to the right of the LCD. This will call up the custom image editor. The main menu for the custom image editor looks like this:

newimage	Draw	clearAll	Delete
[Item:0]	Box	List	Insert

Let's take a closer look at each item in the menu.

When an Image file is first loaded into the editor, its name will appear below "Select" button 1. As you make changes to the file, the file name will disappear and the word "image" will take its place in the menu. This lets you know that the contents of the original file have been modified.

"Item:*nn* " identifies which item in the Image file is currently selected. All parts of the file are stored as a list of items. The first item in the list, "Item:Ø" is drawn first, followed by the remaining items in the list in ascending order. If two items overlap when drawn, the higher numbered item will be drawn over the lower numbered one. By selecting the item number and rotating the knob, you can scroll through the entire contents of the file.

Each item in the file consists of a single drawing primitive (for example; box, oval, line etc.). The primitive that is assigned to a particular item may be found above select button 6. Information on all of the the drawing primitives will be found in the "Reference" chapter.

Selecting "Draw" draws the entire Image file, as it is stored in the editor's buffer.

Selecting "clearAll" deletes all items in the Image file and replaces them with a single solid black box that fills the entire screen of the unit under test.

Caution: The "clearAll" function deletes the entire contents of the file in the editor's buffer and cannot be "undone". All changes that you have made to the file since it was last saved will be lost.

Selecting "Delete" deletes the currently selected item in the Image file. All higher numbered items are shifted to fill the gap that was created.

Selecting "Insert" inserts a new item ahead of the currently selected item in the file. The current item and all higher numbered items are shifted to create a gap.

Selecting "List" allows you to print the contents of the Image file to either the screen of your unit under test or to a printer that is attached to the 8701's RS-232C port. Information on how the the drawing primitives are stored in an Image file are found in the "Reference" chapter.

Example of Creating a Custom Image

In this example we will be using coordinate values that refer to a Format that has an active displayed area of 640 pixels by 480 lines. The physical aspect ratio is assumed to be 4H:3V. If you use a Format that has a different number of active pixels and / or lines, you may have to scale the numbers in the example to get the same results. Figure 4-9 shows the sample image that we will be creating.

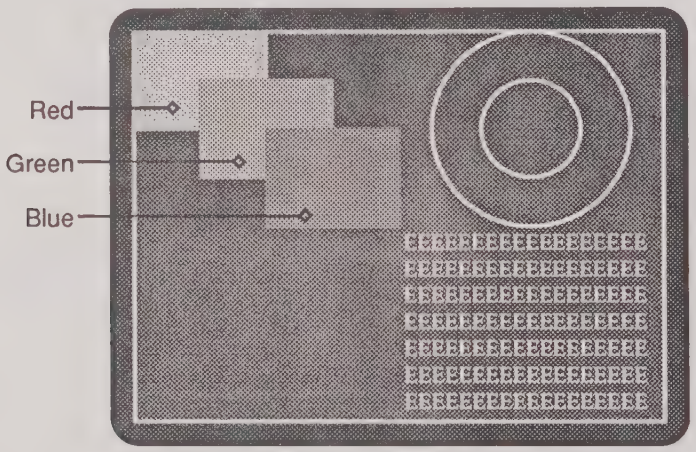


Figure 4-9 Sample Custom Image

The image is drawn in the following manner:

- The display is cleared to a black background.
- A patch of white "E" characters fills the lower right-hand quadrant.
- Three partially overlapping red, green and blue solid rectangles are drawn in the upper left-hand quadrant. The size of each rectangle is equal to one-fourth the width and height of the display area.
- Two concentric white circles are drawn in the center of upper right-hand quadrant. The diameter of the larger circle is equal to half the height of the display area. The size of the smaller circle is half of the larger circle.
- A white outline, one pixel thick, is drawn around the entire display area.

We will start by selecting the default Image file, "newimage" and pressing the "Edit" button. The LCD window should now show the following:

newimage	Draw	clearAll	Delete
[Item:0]	Box	List	Insert

Item number zero (Ø) in the default image has been pre-defined to be a solid black box that fills the entire display. Since we want to start with an all black display, we can leave item Ø as is. With the item number selected, turn the knob clockwise to select item 1. The LCD window should now show the following:

When editing an Image file, the highest item number is always shown as "None" by the editor. The editor is actually pointing to the next available position in the list. This feature allows you to quickly add new items to the end of the current file.

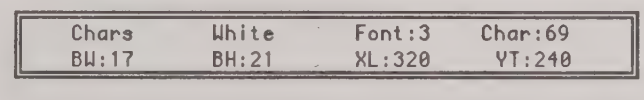
Press the "Edit" button to the right of the LCD. The LCD will change to the following dialog:

The next item we wish to draw is the patch of white "E" characters in the bottom right-hand quadrant of the display. With "None" selected, turn the knob until "Chars" is shown as the being selected.

Select "Continue" and the dialog will continue with the following display on the LCD:

We will define how we want our block of characters drawn. First we will make the color white. Select "Black" from the menu and turn the knob until the selection says "White". Next, let's select a larger style character. Select the current font number "Font:Ø" and change it to 3. You can use the knob or numeric keypad to make the change. If you are using the keypad, make sure that you press "Enter" after typing in the number. Since we want to draw "E's" we do not need to select and change the character code number "Char:69".

The next step is to define the starting location of our block of characters. The pixel coordinate system used by the 8701 places the origin (X=0, Y=0) in the upper left-hand corner of active video. Positive values of X represent points to the right of the origin and positive values of Y represent points below the origin. The parameters above buttons 7 and 8 are the X and Y coordinates of the top left-hand corner of the block of characters. We want our block to start in the center of the screen. The coordinates that we need to enter are 320 for "XL" and 240 for "YT". These values are equal to half the number of active pixels per line and active lines per frame. If you use the knob to enter the coordinates, the block of characters will move in "real time". The LCD should now look like this:



All of the entries, so far, may cause partial characters to appear along the right and bottom edges of the display. We should be able to clear this up by changing the size of the individual character block. The parameters above buttons 5 and 6 are the size of the

character block in pixels. Try changing the current block width (BW) from 17 to 16 pixels and the block height (BH) from 21 to 22 lines. We are done with entering parameters for our block of characters. Press the "Done" button to the right of the LCD. This will return you to the edit sub-menu. Go on to item number 2:

```
   image       Draw      clearAll     Delete
[ Item:2 ]     None        List       Insert
```

The next item that we will draw will be the red box in the upper left-hand corner of the display. With "Chars" selected, turn the knob until "Box" is shown as the being selected.

```
Select primitive :      [  Box   ]  Continue
```

Select "Continue" and the dialog will continue with the following display on the LCD:

```
    Box        Unfilled     Black
    W:0          H:0          XL:0          YT:0
```

Since we want a solid red box we will first select "Unfilled" and rotate the knob until the selection says "Filled". Next, select "Black" and rotate the knob until the selection changes to "Red". The LCD should now look like this:

```
    Box        Filled       Red
    W:0          H:0          XL:0          YT:0
```

The four (4) parameters shown at the bottom of the LCD determine the size and location of the box. The parameters above buttons 5 and 6 are the size of the box in pixels. The parameters above buttons 7 and 8 are the X and Y coordinates of the top left-hand corner of the box. The pixel coordinate system used by the 8701 places the origin (X=0, Y=0) in the upper left-hand corner of active video. Positive values of X represent points to the right of the origin and positive values of Y represent points below the origin.

We want our boxes to be one fourth the height and width of the display. One fourth of the total width, 640 pixels, is 160. One fourth of the total height, 480 lines, is 120. Since the box starts at the extreme upper left-hand corner of the display, its X,Y coordinates are both zero (Ø). The values are entered by selecting the desired parameter and rotating the knob until the correct value is reached. The box will be drawn in "real time" as you change its parameters. Entering our values will leave the LCD looking like this:

```
    Box        Filled       Red
   W:160       H:120         XL:0          YT:0
```

Press the "Done" button to the right of the LCD. This will return you to the editor sub-menu. Go on to item number 3:

```
   image       Draw      clearAll     Delete
[ Item:3 ]     None        List       Insert
```

We will now draw the overlapping Green Box. Press the "Edit" button to the right of the LCD. Again, we will select "Box as the primitive. Next, select "Continue". The LCD will now show the following:

```
    Box        Unfilled     Black
    W:0          H:0          XL:0          YT:0
```

Change the top selections to "Filled" and "Green". The green box is the same size as the red one, so we can again use 160 and 120 as the width and height. This box will be offset by one eighth of the width and height. These values work out to an X offset of 80 pixels to the left edge of the box and 60 lines to the top of the box. Entering these values will leave the LCD looking like this:

```
Box       Filled    Green
W:160     H:120     XL:80     YT:60
```

As you were entering the parameters, you may have noticed that the movement of the green box may have erased all or part of the existing red box. Do not worry about this for now. Press "Done" to get to the editor and then select "Draw". This will redraw the image. You can now go on to selecting item number 4 for editing.

We will draw the blue box next, so select "Box" as the primitive for item 4. Continue with the box parameters. The size is the same as the red and green boxes. This box will be offset twice as much as the green box. The parameters should be entered as shown in the following LCD window:

```
Box       Filled    Blue
W:160     H:120     XL:160    YT:120
```

Next, we will draw the two circles. A circle is a special case of the "Oval" primitive. Select item 5 for editing and choose "Oval" as the primitive. Selecting "Continue" will give you the following sub-menu:

```
Oval      Unfilled  Black
W:0       H:0       XL:0      YT:0
```

Select "White" for the color and leave the oval as "Unfilled". An oval is defined by a rectangular frame that circumscribes it (a rectangle around the outside of the oval that just touches the oval at four points. The width and height of the oval is equal to the width and height of the framing rectangle. The location of the oval is specified by the coordinates of the top left corner of the framing rectangle.

We want our larger circle to have a height equal to half the display height. One half of 480 is 240 pixels. Assuming that our pixels have a square pixel ratio, the width is also 240 pixels.

We now have to calculate our starting coordinates. Since we want our circle to start at the very top, we can use a Y offset value of Ø to locate the top of our framing rectangle. The X value is calculated in the following manner:

- We want the circle to be centered in the upper right-hand quadrant. The X coordinate of the center of the quadrant is equal to 3/4 of the total width. (3/4) * 640 pixels = 480 pixels.
- The X coordinate of the oval is located half the width of the oval to the left of the oval's center. (1/2) * 240 pixels = 120 pixels.
- The starting point is therefore also located 240 pixels to the left of the center of the quadrant. 480 pixels - 120 pixels = 360 pixels.

Enter a value of 360 pixels for the X offset. The LCD window should now look like this:

```
Oval      Unfilled  White
W:240     H:240     XL:360    YT:0
```

Next, we will draw the smaller of the two circles. Select item 6 for editing and choose "Oval" as the primitive. Selecting "Continue" will give you the following sub-menu:

Enter width and height values that are one half of the larger oval's values. In order to center the smaller oval inside of the larger oval, the smaller oval's offsets will need to be located 60 pixels to the right and 60 lines below the larger oval's offset. This makes XL equal to 420 pixels (360 + 60) and YT equal to 60 lines (0 + 60) The sub-menu should look like this when you are done entering the values:

Press "Done" and then select item 7. The very last item that we need to draw is the white outline around the entire image. It will be drawn as an unfilled white box. Select "Box" as the primitive for item 7. Enter the following parameters for the box:

Press "Done" to return to the Image editor. Select "Draw" to draw the complete image. Press the "Done" button again. Since we started with the built-in default Image file, pressing "Done" puts you into the file name editor. If you had started with a previously created and saved file, you would have been asked if you had wanted to save your changes in the original file.

If you wish to save the image that we just created, enter a file name using the file name editor. For more information on saving Image files and the file name editor see a later section in this chapter called "Saving a Format or Image File".

Saving Your Format

Once you have set up a format for a specific display you are testing, you will normally want to save your work. The 8701 uses 3-1/2 inch (double sided \ double density) disks for non-volatile storage of formats. The current version of the operating system software allows you to keep a total of 1ØØ files consisting of Images and Formats, including the default format, on a single disk. In this section we will be discussing how to save a new or edited format to disk.

- Use the following procedure if you are not currently editing format parameters or options:

  1) Press the "Formats" button at the top left of the front panel.

  2) If the format currently running has not had any changes made to it since being loaded from the disk, you will get a typical format selection menu on the LCD that may look something like this:

  The brackets indicate which format is currently loaded. The operating system in this case has assumed that, since no changes were made to the disk file, there was nothing new to save.

  3) If the format that is currently running has had any parameter changes made to it since being loaded from the disk, you will get the last parameter that was edited appearing on the LCD.

  4) Continue with the following steps.

- Use the following procedure if you are currently editing format parameters or options:

  1) Press the "Done" button to the right of the LCD window. The following dialog will appear on the LCD:

  The operating system is asking if you wish to save the edited version of the format as "**formatnn**", where "**formatnn**" is the name of the format that you originally loaded from disk (except if you started with the default formatØØ). The operating system does not allow changing the default format that is saved on the disk. You are given four (4) choices of action at this time.

  2) Pressing the "Cancel" button below the numeric keypad will return you to format parameter editing as if you had never pressed the "Done" button in step 1.

  3) Selecting "Abandon" will abandon all changes to the current format that is running. The operating system does this by loading the original version of the format from an internal buffer. You will get a typical format selection menu on the LCD that may look something like this:

The brackets indicate which format is currently loaded.

4) Selecting "Save" will cause the operating system to search the disk directory to see if a file called "format**nn**.fmt" already exists on the disk. If it does not exist, a new file will be created and the format will be added to the format selection menu. If it does exist, you will get the following dialog on the LCD:

Selecting "Yes" will overwrite the existing format data with the new format data. Selecting "No" will return you to the previous dialog.

5) You may also choose to save your edited format under a different file name. The next section gives the procedure for saving files under a new filename.

Caution: Attempting to save a format to a disk that is write protected (window open) will result in an error message.

Naming a Format or Image File

In this section we will go through a typical procedure for saving a Format or Image. If you are continuing from the previous discussion on creating a Format or Image, you will now be able to save your work. In the following example we will be saving a newly created Format in a file having the name of "my_file". The procedure for saving an Image file is the same as the one for saving Formats.

The current version of the operating system software allows you to save Formats and Images as named files. The file name can consist of up to eight (8) characters. Valid characters are all the lower case letters of the alphabet, the digits Ø thru 9 and the underline character. The operating system distinguishes file types by their extensions. All formats are stored with the extension ".fmt" and images are stored with the extension ".img". The correct extension is added for you. You do not add it yourself. The following procedure starts where the procedures on creating Formats and Images stop.

1) The usual last step, after working on a Format or Image, is to press the "Done" button to the right of the LCD window. If changes were made to the file, you will be asked if you wish to save your work. The question will be in the form of a dialog on the LCD window. If you had created a new Format by starting with a previously created and saved Format "formatØ5", the dialog would look something like this:

   If you had started with a default file you would have immediately been presented with the file name editor menu described in step 5. The operating system is asking you if you wish to save the edited version of the format under the same name you originally loaded from disk. You are given five (5) choices of action at this time.

2) Pressing the "Cancel" button below the numeric keypad will return you to format parameter editing as if you had never pressed the "Done" button in step 1.

3) Selecting "Abandon" will abandon all changes to the current format that is running. The operating system does this by loading the original version of the format from an internal buffer. You will get a typical format selection menu on the LCD that may look something like this:

   The brackets indicate which format is currently loaded.

4) Selecting "Save" will cause the operating system to search the disk directory to see if a file called "formatØ5.fmt" already exists on the disk. If it does not exist, a new file will be created and the format will be added to the format selection menu. If it does exist you will get the following dialog on the LCD:

Selecting "Yes" will overwrite the existing format data with the new format data. Selecting "No" will return you to the previous dialog.

5) You may also choose to save your edited format under a different file name. With the file save dialog showing on the LCD, press the "Edit" button to the right of the LCD window. The LCD will then show the following file name editor:

All of the valid characters that may use are shown in the top row. One of the characters will be hi-lighted by a blinking cursor. The cursor is shown as line under the letter "a" in the example above. By rotating the knob, you can select any of the characters in the top row.

6) Move the cursor to the first letter of the desired file name. Since we are using "my_file" in this example, move the cursor to the letter "m". Select "Add" from the LCD menu. The window should now look like this:

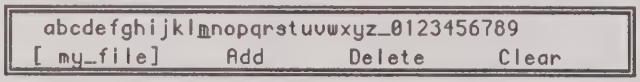
Pressing the select button for "Add" adds the selected character to the end of the file name. The current name is shown between the brackets in the bottom of the LCD window. The file name will always appear centered between the brackets. Since we are just starting, the letter "m" is added to the first character position of the name.

7) Move the cursor to the letter "y", the second letter of our file name. Again, select "Add" from the LCD menu. The window should now look like this:

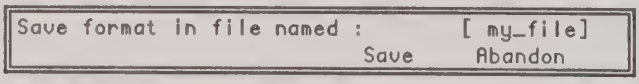
If you accidentally select the wrong letter, select "Delete" from the LCD menu. Selecting "Delete" removes the last letter from the file name.

Selecting "Clear" removes all of the letters from the file name.

8) Continue selecting and adding letters until you entered the entire file name. The window for our example case should look like this:



9) Press the "Done" button to the right of the LCD window. You will be asked to confirm the new file name. The dialog is shown in the following sample window:



Except for the file name, you are back to step 1 of this procedure. All of the same choices are available.

This ends our discussion saving Formats and Images as named files.

Ejecting a Disk

WARNING: The two methods about to be presented here are the only safe ways to eject a disk from the 8701's disk drive. Attempting to remove the disk in any other manner may cause permanent damage to the disk and / or the disk drive. Such damage is not covered by product warranties.

There are two (2) ways for the user to eject a disk from the 8701's disk drive. The first method ejects the disk when the 8701 is turned on, before the operating system is loaded. The second method is used for ejecting a disk at any time after the 8701 has completed its power-up procedure.

To eject a disk from an 8701 that is turned off, use the following procedure:

1) Press, and hold in, the "Cancel" button on the front panel. This button is located in the bottom row of the numeric keypad.
2) While still pressing the "Cancel" button, turn on the power. The switch is located on the rear panel, next to the power cord connection.
3) Wait for the disk to eject. This will happen within a few seconds of the power being turned on.
4) Release the "Cancel" Button.
5) You may now insert a different disk or turn off the 8701. If you leave the unit turned on, it will continue with its normal power up procedure.

To eject a disk from an 8701 that is turned on and operating, use the following procedure:

1) Press the "Macro" button on the front panel. The following menu choices will be shown on the LCD:

```
Eject      Clock     DiskCopy   DiskInit
Install
```

2) Press "Select" button 1 above the label "Eject" on the LCD. The disk will be ejected.
3) You may now insert a different disk. If the disk is not formatted, it must be initialized, using the "DiskInit" macro, prior to being used.
4) Using this method, the 8701 will continue using the operating system software that was originally installed at power up. If you wish to load an operating system from the disk that was just inserted, you will have to cycle power to the 8701.

If you are not able to eject a disk using either of these two methods, contact Quantum Data and ask for assistance.

Initializing (Formatting) a Disk

Caution: Initializing a disk will cause all of the previous contents of the disk to be lost. Any operating system software on the disk will also be lost. The only way to install the operating system software onto a disk is to copy it from another disk containing the software.

Type of Disk Used by the 8701

The 8701 uses 3-1/2 inch micro-disks. The disk is formatted in a double-sided double-density format as part of the disk initialization routine of the 8701. You do not need to purchase pre-formatted blank disks, but the disks must be capable of storing data in a double-sided double-density configuration.

Data is stored on the disk in an MS-DOS compatible format of files and directories.

Initialization Procedure

1) Press the "Macro" button on the front panel. The following "Macros" menu will be shown on the LCD:

```
Eject      Clock      DiskCopy   DiskInit
Install
```

2) If you need to eject the disk that is currently in the drive press "Select" button 1 above the word "Eject" on the LCD. The disk will be ejected.

3) Make sure that the write protect window, on the disk that you want to initialize, is closed.

4) Insert the disk that you want to initialize into the 8701's disk drive.

5) Press "Select" button 4 above the label "DiskInit" on the LCD. The following message and choices will be shown on the LCD:

```
Insert disk to be initialized.      Start
                                    Eject
```

6) Press "Select" button 4 above the label "Start" on the LCD. This will start the initialization process. The process will take a minute or two to complete. The following message will appear during initialization:

```
Initializing disk ...
```

7) When the disk initialization process is completed, the "Macros" menu will reappear on the LCD.

Copying a Disk

Caution: Copying the entire contents of one disk (source disk) to another (target disk) will cause all of the previous contents of the target disk to be lost, including any operating system software.

The following procedure is for copying the entire contents of one disk onto another disk.

1) Press the "Macro" button on the front panel. The following "Macros" menu will appear on the LCD:

```
Eject      Clock      DiskCopy   DiskInit
Install
```

2) If your target disk is not currently readable by the 8701, initialize the disk using the "DiskInit" macro. Brand new disks, right out of the box, must be initialized first.

3) Make sure that the write protect window of the target disk is closed. **As an added measure of safety, you may wish to open the write protect window of the source disk.**

4) Press "Select" button 3 above the word "DiskCopy" on the LCD. The following dialog will appear on the LCD:

```
Insert source disk in drive.          Start
                                      Eject
```

5) Pressing the "Cancel" button to the right of the LCD will abort the disk copying procedure and return you to the "Macros" menu. Pressing the button below "Eject" will cause any disk currently in the drive to be ejected. Pressing the button above "Start" will start copying the contents of the disk currently in the drive to the mainframe's memory. Picture (image) memory is used for this purpose. As the disk is being read, the following message will appear on the LCD:

```
Reading sectors ...                   [ ■■■      ]
```

The row of black boxes in the upper right-hand corner of the LCD will grow as the process continues. Pressing any button on the 8701's front panel, prior to the completion of reading the disk, will abort the entire disk copying procedure.

6) The source disk will be ejected after its contents have been copied to memory and the following dialog will appear on the LCD:

```
Insert target disk in drive.          Continue
                                      Eject
```

7) Pressing the "Cancel" button will abort the Disk copying procedure and return you to the "Macros" menu. Pressing the button below "Eject" will

cause any disk currently in the drive to be ejected. Pressing the button above "Continue" will start writing the contents of the mainframe's memory, containing the source disk's data, to the disk currently in the drive. As the disk is being written, the following message will appear on the LCD:

The row of black boxes in the upper right-hand corner of the LCD will grow as the process continues. Pressing any button on the 8701's front panel, prior to the completion of filling the disk, will abort the procedure. The contents of the target disk will be in an unknown state, if the procedure is aborted while writing to the disk.

8) The target disk will be ejected and the "Macros" menu will appear on the LCD after the copying procedure is completed.

Deleting (Cutting) a File

The current version of the operating system software allows you to delete Format and Image files from a disk, a single file at a time. Pressing the "Cut" button to the right of the LCD after selecting a Format or Image lets you delete the selected file from the disk. You will be asked to confirm your command with a dialog that will look something like this:

The file name that you have selected will appear to the right of the colon. In the sample dialog, a filename of "format25.fmt" is shown. Selecting "Confirm" will delete the file. Pressing the "Cancel" button under the numeric keypad will abort the procedure without deleting anything.

Caution: Cutting a file deletes the file from the disk. There is no way to recover the data once a file has been cut.

Setting the Internal Real Time Clock

The 8701 Imager contains an internal, battery powered, time keeping and calendar circuit. The current version of the operating system software adds the current time and date information to all files whenever they are saved. The approximate current local time (in Elgin, IL) and date are set before the 8701 leaves the factory. The time and / or date may be changed by using the following procedure:

1) Press the "Macros" button on the front panel. The following "Macros" menu will appear on the LCD:

2) Press the "Select" button above the word "Clock". The current time and date, at the instant the button was pressed, will appear on the LCD. A typical time and date display is shown here:

The internal clock will keep running, but will not continuously update the time and date shown on the display.

3) Pressing any "Select" button, except the one below the word "Set", will select the parameter associated with that button for changing. For example, to change the current "Hour" setting , you would first press "Select" button 1. Brackets will appear around the selected parameter as shown in the following example of the LCD window:

4) The hours, minutes, seconds, month, day of the month and year may be changed by either using the numeric keypad or knob. The "AM / PM" parameter may be changed only with the knob.

5) When adjusting the settings to match your own local time, enter a time that is about a minute or so into the future. The internal clock and calendar are not actually updated to match the entered value(s) until you press the button below "Set".

A problem with the clock or battery will give a "CLOCK NOT SET" warning message during the 8701's power up sequence. A hardware failure is indicated, if the 8701 cannot keep accurate time while power is turned on. Failure to keep accurate time while power is off may indicate a weak battery that needs replacing.

Installing Video Plug-in Modules

Six (6) thumbscrews secure the video plug-in to the 8701 mainframe. Two (2) of the screws are jack screws. Their purpose is to make it easier for you to mate and unmate the connectors used between the mainframe and the plug-in. The other four (4) retaining screws help to keep the module firmly attached to the mainframe. All of the screws are turned counter-clockwise to remove and clockwise to tighten. The locations of the screws are shown in the Figure 4-10. All plug-ins have the screws in the same location.

Note: If you replace a video plug-in with a different type, make sure the operating system software is properly installed for the new plug-in. The current configuration of the software is displayed on the LCD as part of the standard power-up procedure of the 8701. If the configuration is incorrect, you will need to perform the "Install" Macro function.

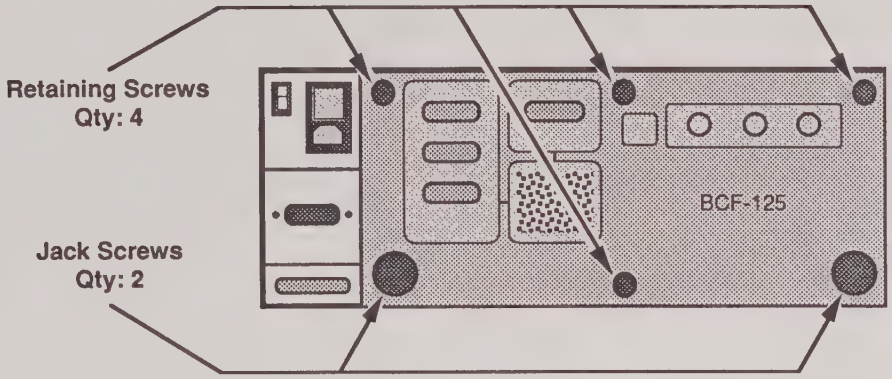


Figure 4-10 Video Plug-In Mounting Screws

The following steps should be followed in order to remove a video plug-in without damage:

1. Turn the 8701 off and unplug it from the AC power source. Failure to perform this step may cause permanent damage to the plug-in and the mainframe as well as serious or fatal injury to yourself!
2. Remove the four (4) retaining screws. These are the smaller knurled thumbscrews.
3. Unscrew the two (2) jack screws. These are the larger knurled thumbscrews. As these screws are turned they will disconnect the plug-in's connectors from the mainframe. The screws should be turned simultaneously such that the plug-in is pulled straight back and not at an angle.
4. The four screws removed in step 1 should be used to mount the replacement module.The jack screws are permanently attached to each module.
5. Do not plug the 8701 into an AC power source without a plug-in installed. Doing so will expose you to AC line voltages within the mainframe which may cause serious or fatal injury!

The following steps should be followed in order to install a video plug-in without damage:

1. Make sure that the 8701 is unplugged from the AC power source. Failure to do so may cause permanent damage to the plug-in and the mainframe as well as serious or fatal injury to yourself!
1. Place the plug-in so that the module's edge connectors start to mate with the edge of the large printed circuit board in the mainframe.
2. Check to make sure that no components or coaxial cables will be pinched when the plug-in is fully installed.
3. Screw in the plug-in's two (2) jack screws. As these screws are turned they will fully seat the plug-in's connectors with the mainframe. The screws should be turned simultaneously such that the plug-in is slid straight in and not at an angle. Do not fully tighten the screws yet.
4. Install, but do not tighten the four (4) retaining screws in the locations shown in the figure. These are the smaller knurled thumbscrews that were used to mount the previous module in the mainframe.
5. Tighten the screws after they are all in place.
6. Power may now be reconnected.

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Front Panel Controls and Displays

Change Buttons, Knob and LED

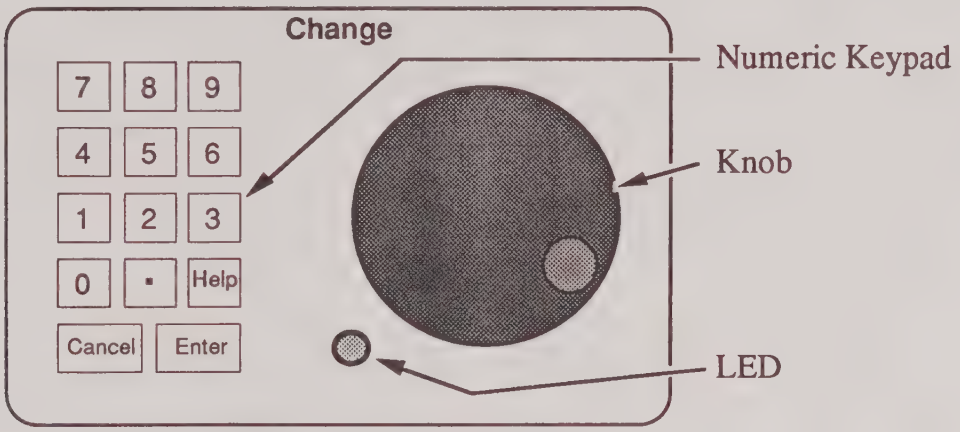


Figure 5-1 The Front Panel "Change" Group

Figure 5-1 shows the "Change" group of the 8701's front panel. The buttons and knob in this area allow you to change the current values of many of the parameters that are displayed on the LCD.

LED

The LED, when lit, indicates that the knob may be used for changing (tweaking) a value selected on the LCD.

Numeric Keypad

These buttons allow you to change (or enter) the values of parameters displayed on the LCD by typing in the desired value.

Cancel Button

This button, at the bottom of the numeric keypad, clears out any numbers that are being typed in on the numeric keypad, but have not been entered. The displayed number is restored to the previously entered value.

Enter Button

This button, at the bottom of the numeric keypad, tells the 8701 that you are done typing in a number and that the 8701 should now act on it.

The Knob

This is a proportional control that allows you to change the values of Format parameters in real-time. The knob is active whenever the LED, located below it, is lit. The knob is also used for scrolling through the list of available Formats.

Help

The current version of the operating system software makes limited use of this button. Certain Error Messages allow the user to press the Help Button to get assistance in resolving the error.

File Buttons

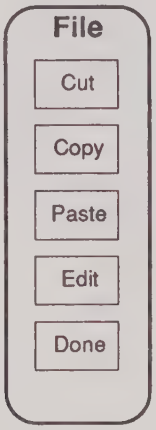


Figure 5-2 The Front Panel "File" Group

Figure 5-2 shows the "File" group of the 8701's front panel. The "Copy", and "Paste" buttons are not supported by the current version of the operating system software. The "Cut" button lets you delete Format files. The "Edit" and "Done" buttons allow you to open and close Format files. In addition, the "Edit" button, lets you change the attributes of some of the Instant-Expert images.

Cut

Pressing the "Cut" button after selecting a Format or Image file lets you delete the selected file from the disk. Since cutting a file is irreversible, you will be asked to confirm your actions in a dialog on the LCD.

Edit

The current version of the operating system software several different uses of this button.

Pressing the "Edit" button after selecting a Format file lets you edit the contents of that Format.

Pressing the "Edit" button after selecting an Image file lets you edit the contents of that Image. Once you start editing an image, the "Edit" button lets you edit the individual primitives that make up the image.

Some of the "Instant Expert" images allow you to change the way that they are drawn. For example, the test image for testing color convergence can be drawn with any combination of primary colors. The test image that fills the display's screen with a single character allows you to do the following: 1) select any one (1) character from any of the included font sets; 2) independently set the horizontal and vertical character spacing in one pixel increments; 3) set the top and bottom margins in one pixel increments; 4) set

the side margins in one pixel increments and 5) invert the video. The individual pattern descriptions in the "Images" chapter has information on which images may be edited.

Done

The current version of the operating system software supports several different uses of this button.

Pressing the "Done" button while editing a Format (a Format parameter or option showing on the LCD) will cause the 8701 to check to see if you made any changes to a Format since it was first loaded. If any changes were made, the 8701 will start a dialog on the LCD asking if you wish to save the edited Format.

Pressing the "Done" button while editing an Image file will cause the 8701 to start a dialog on the LCD asking if you wish to save the edited Image. The "Done" button is also used to indicate that you are done editing the attributes of an individual primitive of an Image.

Pressing the "Done" button while editing the attributes of an Instant-Expert image will return you to the previously displayed Instant-Expert menu.

Format Buttons and LED's

All of the buttons in the "Format" area have to do with setting up the 8701 signals to properly drive the display you have connected to the video and sync outputs. Due to the vast variety of types of displays that exist, the 8701 needs to have a minimum amount information about how your particular display operates. Figure 5-3 shows all of the Format buttons. The buttons that have a heavy black outline represent the minimum set of parameters that you will typically need to enter. The two (2) areas, on the left, marked "Horizontal" and "Vertical" are not buttons. They are labels that indicate that all of the buttons in that particular row deal with either horizontal or vertical signal parameters.

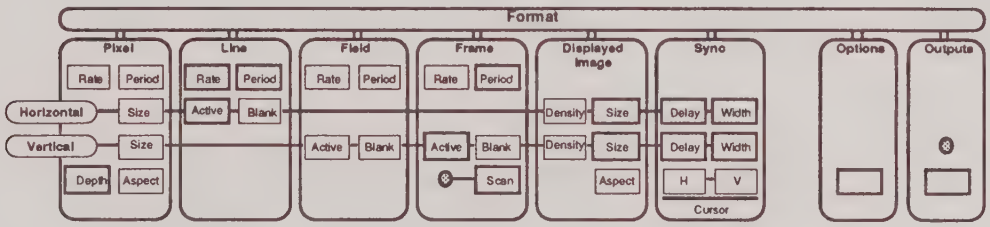


Fig. 5-3 Format Buttons

Related buttons are grouped under six (6) sub-headings.

The five (5) buttons under "Pixel" deal with parameters that describe a single pixel.

The four (4) buttons under "Line" deal with parameters that describe a single horizontal scan line. The parameters that describe the Horizontal Sync pulse timing are in the "Sync" group.

The four (4) buttons under "Field" deal with parameters that describe a single vertical sweep. The parameters that describe the Vertical Sync pulse timing are in the "Sync" group.

The five (5) buttons under "Frame" deal with parameters that describe a complete frame of video, which may be made up of one or more individual fields.

The five (5) buttons under "Displayed Image" deal with parameters that describe the physical size of the displayed image. These parameters do not affect the timing of any of the signals, but they do have a profound affect on how the 8701 draws certain types of images.

The six (6) buttons under "Sync" deal with parameters that describe the timing of the vertical and horizontal sync pulses.

The single "Options" button gives you access to additional Format parameters that deal primarily with selecting and controlling the individual signal outputs.

The single "Output" button toggles all of the video and sync outputs on and off.

Most of the buttons allow you to select a particular parameter for both viewing and changing. Other buttons allow you to only view the value of a particular parameter, but not change it. These parameters are calculated from other entered parameters. Figure 5-4 shows which Format buttons let you both read and change the value of the parameter associated with that button. The buttons are high-lighted in the figure by a solid outline.

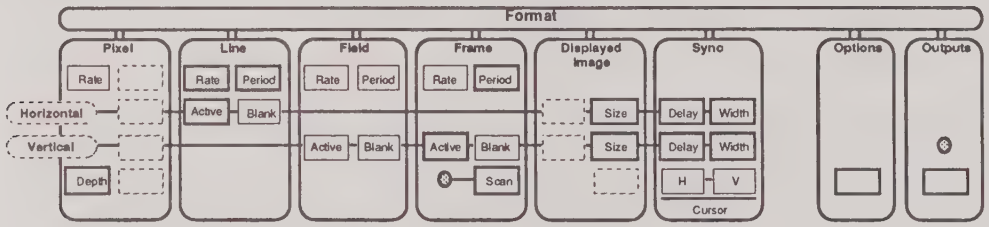


Figure 5-4 Format Parameter Read & Edit Buttons

Figure 5-5 shows a general syntax diagram for selecting a Format parameter and changing its value with either the numeric keypad or knob. The knob changes Format parameter values in real-time. With the outputs on, you can immediately see the affects on your unit under test as the knob is rotated.

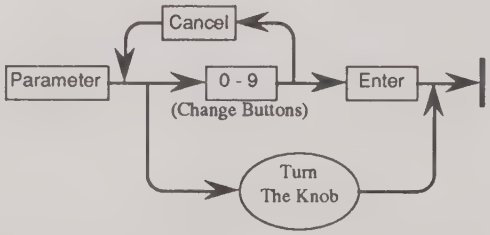


Figure 5-5 Parameter Entry Syntax Diagram

Figure 5-6 shows a specific flow chart for changing the values for default formatØØ's "Line Blank" parameter from 160 to 200 pixels. Information displayed on the LCD is shown both before and after the entry. Other parameters are changed in a similar manner.

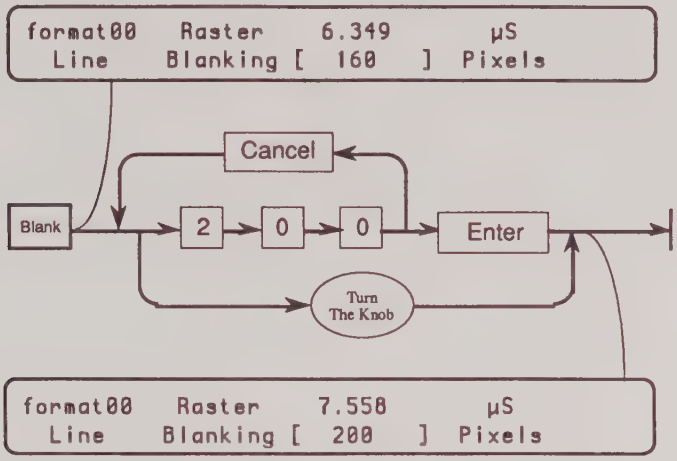


Figure 5-6 Changing Line Blank

How Parameters Inter-relate

Certain groups of editable Format parameters are closely inter-related. For example, "Line Period" is always equal to the sum of "Line Active" plus "Line Blank". To be mathematically correct, changing the value of one of these must change the value of one or more other parameters. These three (3) parameters form a constraint triad.

You will normally only need to enter two (2) of the triad's parameters and let the operating system calculate the third parameter for you. Which two do you enter? The preferred method is to enter the two triad parameters whose front panel buttons are outlined in black. In our case, "Line Period" and "Line Active" have outlined buttons and would normally be the two values to enter. "Line Blank" would be left as a calculated value. The operating system software, however, allows you to enter values for all three of the parameters. Instead of giving an error message when the parameters do not agree, the operating system will change the value of one of the parameters, to keep the relationships correct.

How does the operating system decide which parameter to change? It looks at which two (2) of the parameters of a given constraint triad have had the most recent data entries. The third parameter, having the oldest or no entry, is then changed if need be. For example consider the following sequence of parameter entries:

1) Line Period set to 1ØØØ pixels.
2) Line Active set to 8ØØ pixels.
3) Line Blank set to 3ØØ pixels.

Selecting the "Line Period" parameter would now show that its value was increased to 11ØØ pixels. If you re-entered your original Line Period value of 1ØØØ pixels, you would find that the value of Line Active , having been the least recent entry, would have decreased to 7ØØ pixels.

Two additional constraint triads are used by the operating system. The first of these consists of the "Field Period", "Field Active" and "Field Blank" parameters. The relationship is that "Field Period" is equal to the sum of "Field Active" plus "Field Blank". The other constraint triad consists of the "Frame Period", "Frame Active" and "Frame Blank" parameters. The relationship is that "Frame Period" is equal to the sum of "Frame Active" plus "Frame Blank".

For the three (3) constraint triads just discussed, you will get an error message if the result of any calculation is a negative value.

Another type of constraint concerns the relationship between "Pixel Rate", "Line Rate", "Field Rate" and "Frame Rate" parameters. The operating system looks at which parameter had the most recent entry and uses it as the reference frequency. The other three rates then become calculated values. The following chart shows the relationship between the four (4) rates:

	When Pixel Rate is the Reference	When Line Rate is the Reference	When Field Rate is the Reference	When Frame Rate is the Reference
Pixel Rate equals	ref.	Line Rate x Line Period	Line Rate x Line Period	Line Rate x Line Period
Line Rate equals	Pixel Rate ÷ Line Period	ref.	Field Rate x Field Period	Field Rate x Field Period
Field Rate equals	Line Rate ÷ Field Period	Line Rate ÷ Field Period	ref..	Frame Rate x Frame Scan
Frame Rate equals	Field Rate ÷ Frame Scan	Field Rate ÷ Frame Scan	Field Rate ÷ Frame Scan	ref.

Read Only Parameters

Figure 5-7 shows which Format buttons let you just read the value of the parameter associated with that button. The buttons are high-lighted in the figure by a solid outline.

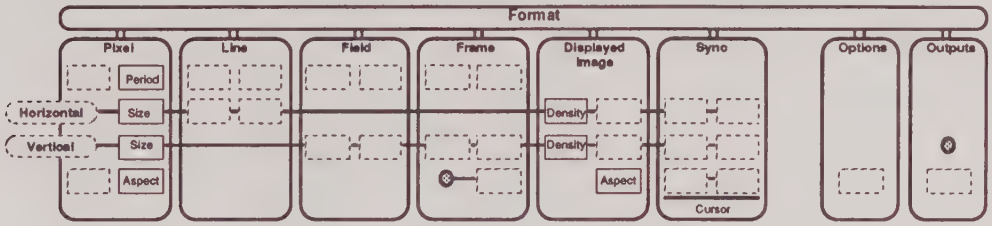


Fig. 5-7 Format Parameter Read Only Buttons

Pressing the button for a particular parameter will cause that parameter's value to be displayed.

A description of all of the Format buttons follows. The descriptions are grouped by sub-headings. Parameters in **Bold Face** are the minimum set of values that you need to enter in order to drive a particular display.

Pixel Parameters

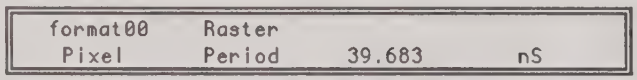
Rate

Type: Read, Edit and Reference
Unit of Measure: Megahertz (MHz)
Symbol: PelRate
Also Called: Dot Clock, Video Rate
Description: Pixel rate is the rate at which the individual pixels on a horizontal scan line are being generated. Selecting the pixel rate parameter will give you the following typical presentation on the LCD:

The pixel rate is equal to the line rate multiplied by the sum of the number of active pixels on a line plus the number of blanked pixels on a line. The pixel rate should normally be left as a calculated value. Entering a new pixel rate will make it the reference frequency used by the 8701; the line, field and frame rates will become calculated values.

Period

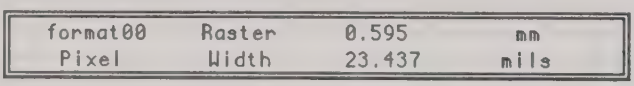
Type: Read Only
Unit of Measure: nanoseconds
Symbol: PelTime
Also Called: ---
Description: The pixel period is the amount of time it takes to display a single pixel. Selecting the pixel period parameter will give you the following typical presentation on the LCD:



The pixel period is equal to the inverse of the pixel rate.

Horizontal Size

Type: Read Only
Unit of Measure: millimeters or mils (thousandths of an inch)
Symbol: PelSizeWidth
Also Called: Pixel Width
Description: The horizontal pixel size is the theoretical physical width of a single pixel on your display. Selecting the horizontal pixel size parameter will give you the following typical presentation on the LCD:



The horizontal size is equal to the displayed image horizontal size divided by the number of active pixels on a Line. The actual width of a pixel may be larger due to the actual spot size and focus limitations of your display.

Vertical Size

Type: Read Only
Unit of Measure: millimeters or mils (thousandths of an inch)
Symbol: PelSizeHeight
Also Called: Pixel Height
Description: The vertical pixel size is the theoretical physical height of a single pixel on your display. Selecting the vertical pixel size parameter will give you the following typical presentation on the LCD:

The vertical size is equal to the displayed image vertical size divided by the number of active lines in a frame. The actual height of a pixel may be larger due to the actual spot size and focus limitations of your display.

Depth

Type: Read and Edit
Unit of Measure: Bit(s) per pixel
Symbol: ---
Also Called: ---
Description: The pixel depth is the number of data bits that the 8701 uses to represent a single pixel. Selecting the pixel depth parameter will give you the following typical presentation on the LCD:

The value affects the total number of colors or shades of gray that the 8701 can produce at a given time. Valid values are 1-bit (2 colors or shades), 2-bits (4 colors or shades), 4-bits (16 colors or shades) or 8-bits (256 colors or shades). The 8701 will normally give you the maximum number that is available. The maximum number of bits-per-pixel is limited by the amount of video memory installed in the 8701 mainframe, the number of displayed images that need to be stored in video memory at the same time, the number of displayed pixels in an image and the pixel rate. Entering a smaller value will increase the number of displayed images that may be stored in video memory at the same time. Entering a larger value will give you an error message.

Aspect

Type:	Read Only
Unit of Measure:	None (Ratio of Width to Height)
Symbol:	PelAspect
Also Called:	Pixel Aspect Ratio
Description:	Pixel aspect is the ratio of the pixel horizontal size divided by the pixel vertical size. Selecting the pixel aspect parameter will give you the following typical presentation on the LCD:

A value of one (1) indicates that the pixel is square. This value may or may not be the same as displayed image aspect ratio.

Line Parameters

Rate

Type: Read, Edit and Reference

Unit of Measure: Kilohertz (KHz)

Symbol: LineRate

Also Called: Horizontal Scan Rate

Description: The line rate is the total number of horizontal scan lines, left to right and retrace, that a display traces on its screen each second. Selecting the line rate parameter will give you the following typical presentation on the LCD:

Entering a new line rate will make it the reference frequency used by the 8701; the pixel, field and frame rates will be calculated values. If you use the pixel rate as a reference, the line rate will be a calculated value equal to the pixel rate divided by the sum of the number of active pixels on a line plus the number of blanked pixels on a line. If the field rate is used as a reference, the line rate will equal the field rate multiplied by the sum of the number of active lines in a field plus the number of blanked lines in a field .

This is normally the only frequency that you will need to enter for a particular display. If the spec sheet for your display gives you a line period instead of a line rate, you will first have to calculate the line rate by taking the reciprocal of the line period.

Period

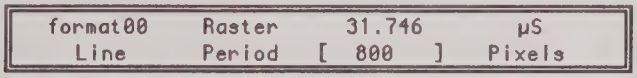
Type: Read and Edit
(Part of Line Period, Line Active and Line Blank Triad)

Unit of Measure: Pixels

Symbol: LinePeriod

Also Called: Total Pixels per Line or Line Time

Description: The line period is the amount of time it takes for the display to scan one (1) horizontal line and come back to its starting point. Line period (in microseconds) is the inverse of the line rate. Line period (in pixels) is equal to the pixel rate divided by the line rate. Selecting the line period parameter will give you the following typical presentation on the LCD:



The 8701 keeps track of the line period as the total integer number of active plus blanked pixels per horizontal scan line. You would not normally need to change this parameter

directly, but you can. Changing the line period by a certain number of pixels will change line blank parameter by the same amount.

When either line rate or field rate is used as the reference frequency, an increase in the line period will cause an increase in the pixel rate. The line period (in microseconds) will not change.

When the pixel rate is the reference frequency, increasing the line period (in pixels) will cause a proportional increase of the line period in microseconds.

Active

Type: Read and Edit
(Part of Line Period, Line Active and Line Blank Triad)

Unit of Measure: Pixels

Symbol: LineActive

Also Called: Displayed Pixels per Line or Horizontal Resolution

Description: Line Active is the number of displayable pixels per horizontal scan line. Selecting the line active parameter will give you the following typical presentation on the LCD:

format00	Raster	25.397	µS
Line	Active	[640]	Pixels

The 8701 keeps track of the line active period in pixels. You will normally need to enter a value for this parameter when setting up a new Format. Increasing line active by a given number of pixels will increase the line period (in pixels) by the same number of pixels. If the specifications for your display call for a certain number of displayed pixels per line, just enter that value.

If your specifications call out the active time in microseconds, the number of displayed pixels per line is equal to the desired active time (in microseconds) multiplied by the desired pixel rate (in MHz). The active time (in microseconds) may not be correct when you enter the number of active pixels; the line blank parameter may need changing as well.

When either line rate or field rate is used as the reference frequency, an increase in the line active will cause an increase in the pixel rate.

When the pixel rate is the reference frequency, increasing the line active (in pixels) will cause an increase of the line active in microseconds and the line period in microseconds.

Blank

Type: Read and Edit
(Part of Line Period, Line Active and Line Blank Triad)

Unit of Measure: Pixels

Symbol: LineBlank

Also Called: Blanked Pixels per Line, Horizontal Blanking

Description: Line blank is the number of blanked pixels per horizontal scan line. Selecting the line blank parameter will give you the following typical presentation on the LCD:

```
format00    Raster      6.349       µS
  Line     Blanking  [  160   ]   Pixels
```

The 8701 keeps track of the line blank period as an integer number of pixels. Increasing line blank by a given number of pixels will increase the line period by the same number of pixels. You will normally need to enter a value for this parameter when setting up a new Format. If the specifications for your display call for a certain number of blanked pixels per line, just enter that value.

If your specifications call out the blanking time in microseconds, the number of blanked pixels per line is equal to the desired blanking time (in microseconds) multiplied by the desired pixel rate (in MHz). The blanking time (in microseconds) may not be correct when you enter the number of blanked pixels; the line active parameter may need changing.

Entering a line blanking time that is too short for a particular display will cause any images that are drawn to be clipped or wrapped at both sides of the raster. An image that is clipped or wrapped on only one side may be caused by either an improperly set horizontal sync delay parameter or not enough blanking time.

When either line rate or field rate is used as the reference frequency, an increase in the line blank will cause an increase in the pixel rate.

When the pixel rate is the reference frequency, increasing the line blank (in pixels) will cause an increase of the line blank (in microseconds) and the line period (in microseconds).

Field Parameters

Rate

Type: Read, Edit and Reference
Unit of Measure: Hertz (Hz)
Symbol: FieldRate
Also Called: Vertical Rate
Description: The field rate is the number of times per second that a display's vertical scanning mechanism moves from the top of the screen to the bottom and retraces to the top. Selecting the field rate parameter will give you the following typical presentation on the LCD:

```
format00    Raster
 Field       Rate    [ 60.000 ]      Hz
```

The field rate is equal to the line rate divided by the sum of the number of active lines per field plus the number of blanked lines per field. The field rate should normally be left as a calculated value. Entering a new field rate will make it the reference frequency used by the 8701; the pixel, line and frame rates will become calculated values.

Period

Type: Read and Edit
Unit of Measure: Pixels
Symbol: FieldPeriod
Also Called: Total Lines per Field
Description: The field period is the amount of time it takes for the display to scan one (1) vertical field of video information and return to its starting point. Field period (in milliseconds) is the inverse of the field rate. Field period (in pixels) is equal to the line rate divided by the field rate. Selecting the field period parameter will give you the following typical presentation on the LCD:

```
format00    Raster      16.666        mS
 Field      Period   [ 525.0  ]    Pixels
```

The 8701 keeps track of the field period as the total number of active plus blanked scan lines per field. For non-interlaced formats (Frame Scan = 1), the value is an integer number. For interlaced formats (Frame Scan = 2), the value is an integer number plus 1/2. You would not normally need to change this parameter directly, but you can. Changing the field period by a certain number of lines will change field blank parameter by the same amount.

When the field rate is the reference frequency, increasing the field period (in pixels) will cause a proportional increase of the line rate and pixel rate.

When either the pixel rate or line rate is used as the reference frequency, an increase in the field period (in pixels) will cause a decrease in the field rate. The field period (in milliseconds) will increase.

Active

Type: Read and Edit

Unit of Measure: Lines

Symbol: FieldActive

Also Called: Displayed Lines per Field

Description: Field active is the number of displayable scan lines per vertical field. Selecting the field active parameter will give you the following typical presentation on the LCD:

```
format00    Raster      15.238      mS
 Field      Active   [  480   ]   Lines
```

The 8701 keeps track of the field active period by the number of horizontal scan lines. You will not normally need to enter a value for this parameter when setting up a new Format. Increasing field active by a given number of lines will increase the field period (in pixels) by the same number of pixels. If the specifications for your display call for a certain number of displayed lines per field, just enter that value.

For non-interlaced formats (Frame Scan = 1), the value of the field active parameter is equal to the frame active parameter. For interlaced formats (Frame Scan = 2), the value of the field active parameter is equal to half (1/2) the frame active parameter.

If your specifications call out the field active time in milliseconds, the number of displayed lines per field is equal to the desired active time (in milliseconds) multiplied by the line rate (in kiloHertz). The active time (in milliseconds) may not be correct when you enter the number of active pixels; the field blank parameter may need changing.

When either pixel or line rate is used as the reference frequency, an increase in the field active will cause a decrease in the field rate.

When the field rate is the reference frequency, increasing the field active (in lines) will cause a proportional increase in the line and pixel rates.

Blank

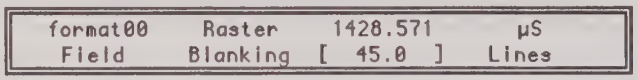
Type: Read and Edit

Unit of Measure: Lines

Symbol: FieldBlank

Also Called: Vertical Blanking

Description: Field blank is the number of blanked lines per vertical field. Selecting the field blank parameter will give you the following typical presentation on the LCD:



The 8701 keeps track of the field blank period by the number of horizontal scan lines (to the nearest half line with interlace). You will normally need to enter a value for this parameter when setting up a new format. Increasing field blank by a given number of lines will increase the field period (in pixels) by the same number of pixels. If the specifications for your display call for a certain number of blanked lines per field, just enter that value.

For non-interlaced formats (Frame Scan = 1), the value of the field blank parameter is equal to the frame blank parameter. This will be an integer number of lines.

For interlaced formats (Frame Scan = 2), the value of the field blank parameter is equal to one half (1/2) the frame blank parameter. The frame blank parameter will be an odd integer and the field blank parameter will be an integer number plus 1/2.

If your specifications call out the field blank time in milliseconds, the number of blanked lines per field is equal to the desired blank time (in milliseconds) multiplied by the line rate (in KHz). The field blank time (in milliseconds) may not be correct when you enter the calculated number of blanked lines; the field active parameter may need changing.

Entering a field blanking time that is too short for a particular display will cause any images that are drawn to be clipped or wrapped at both the top and bottom of the raster. An image that is clipped or wrapped at only the top or bottom may be caused by either an improperly set vertical sync delay parameter or not enough blanking time.

When either pixel rate or line rate is used as the reference frequency, an increase in the field blank parameter will cause a decrease in the field rate.

When the field rate is the reference frequency, increasing the field blanking (in lines) will cause a proportional increase in the line and pixel rates.

Frame Parameters

Rate

Type: Read, Edit, and Reference
Unit of Measure: Hertz (Hz)
Symbol: FrameRate
Also Called: Picture Rate, Picture Refresh Rate
Description: The frame rate is the number of time per second that a complete image is displayed. Selecting the frame rate parameter will give you the following typical presentation on the LCD:

For a non-interlaced Format, the Frame Rate is equal to the Field Rate. For a 2:1 interlaced Format, the Frame Rate is one half (1/2) of the Field Rate.

Period

Type: Read and Edit
Unit of Measure: Lines
Symbol: FramePeriod
Also Called: ---
Description: The frame period is the amount of time that it takes for the display to draw one complete image. Frame period (in milliseconds) is the inverse of the frame rate. Selecting the field period parameter will give you the following typical presentation on the LCD:

For a non-interlaced Format, the Frame Period is equal to the Field Period. For a 2:1 interlaced Format, the Frame Period is an odd number that is twice the Field Period.

Active

Type: Read and Edit
Unit of Measure: Lines
Symbol: FrameActive
Also Called: Vertical Resolution
Description: Frame active is the number of displayed scan lines per image. Selecting the frame active parameter will give you the following typical presentation on the LCD:

For a non-interlaced Format, the frame active is equal to the field active. For a 2:1 interlaced Format, the frame active is twice the field active.

Blank

Type: Read and Edit
Unit of Measure: Lines
Symbol: FrameBlank
Also Called: ---
Description: Frame blank is the number of blanked scan lines per image. Selecting the frame blank parameter will give you the following typical presentation on the LCD:

format00	Raster	1428.571	µS
Frame	Blank	45	Lines

For a non-interlaced Format, the frame blank parameter is equal to the field blank parameter. For a 2:1 interlaced Format, the frame blank parameter (in lines) is an odd number that is twice the field blank parameter.

Scan

Type: Read and Edit
Unit of Measure: Fields per Frame
Symbol: FrameScan
Also Called: Interlaced or Non-Interlaced
Description: Frame scan is the number of vertical fields per frame of video. Selecting the frame scan parameter will give you the following typical presentation on the LCD for a non-interlaced format:

format00	Raster	non-	Intrlace
Frame	Scan	[1]	Field

Selecting the frame scan parameter will give you the following typical presentation on the LCD for an interlaced format:

format00	Raster		Intrlace
Frame	Scan	[2]	Fields

Current versions of the hardware and operating system software limit you to no more than two (2) fields per frame when interlacing. Most interlaced displays use this 2:1 ratio. The red LED to the left of the frame scan button will be lit whenever the 8701 has an interlaced Format selected.

Displayed Image Parameters

Horizontal Density

Type: Read Only
Unit of Measure: Dots per Inch
Symbol: ViewDensityWidth
Also Called: ---
Description: Displayed image horizontal density is the number of pixels per inch, horizontally, being generated on your display. Selecting the horizontal density parameter will give you the following typical presentation on the LCD:

Horizontal density is equal to line active (in pixels) divided by horizontal size (in inches). This value will only be correct when the value entered for the horizontal size parameter matches the actual width of the active video area on your display.

Horizontal Size

Type: Read and Edit
Unit of Measure: Inches or millimeters
Symbol: ViewSizeWidth
Also Called: ---
Description: Displayed image horizontal size is the physical width of the displayed image on a properly adjusted monitor. Selecting the horizontal size parameter will give you the following typical presentation on the LCD:

You will normally need to enter a value for this parameter when setting up a new Format. This is one of the few parameters that allow you to select and change either of the two (2) values shown. Entering a value, in either inches or millimeters will automatically show the equivalent value for the other unit of measure. The parameter does not affect the overall size of any image drawn by the 8701 nor does it affect the timing of any of the signals generated. However, entering a value that does not match the physical width of the display area may cause any circles that are drawn to be elliptical and all squares to be rectangles. The value of the parameter, in inches, is also used to label the horizontal dimension of the "Instant-Expert" image used to check the display size.

Vertical Density

Type: Read Only
Unit of Measure: Pixels per Inch
Symbol: ViewDensityHeight
Also Called: ---
Description: Displayed image vertical density is the number of pixels per inch, vertically, being generated on your display. Selecting the vertical density parameter will give you the following typical presentation on the LCD:

Vertical density is equal to Frame active (in lines) divided by vertical size (in inches). This value will only be correct when the value entered for the vertical size parameter matches the actual height of the active video area on your display.

Vertical Size

Type: Read and Edit
Unit of Measure: Inches or millimeters
Symbol: ViewSizeHeight
Also Called: ---
Description: Displayed image vertical size is the physical height of the displayed image on a properly adjusted monitor. Selecting the vertical size parameter will give you the following typical presentation on the LCD:

You will normally need to enter a value for this parameter when setting up a new Format. This is one of the few parameters that allow you to select and change either of the two (2) values shown. Entering a value, in either inches or millimeters will automatically show the equivalent value for the other unit of measure. The parameter does not affect the overall size of any image drawn by the 8701 nor does it affect the timing of any of the signals generated. However, entering a value that does not match the physical height of the display area may cause any circles that are drawn to be elliptical and all squares to end up as rectangles. The value of the parameter, in inches, is also used to label the vertical dimension of the "Instant-Expert" image used to check the display size.

Aspect

Type:	Read Only
Unit of Measure:	None (Ratio of Width to Height)
Symbol:	ViewAspect
Also Called:	Aspect Ratio
Description:	Displayed image aspect is the ratio of the physical width to the physical height of the displayed image on a properly adjusted monitor. Selecting the aspect parameter will give you the following typical presentation on the LCD:

The value in the example is for a 4:3 aspect ratio, which is a typical value for many types of CRT displays.

Sync Parameters

Horizontal **Delay**

Type: Read and Edit
Unit of Measure: Pixels
Symbol: HSPDelay
Also Called: Horizontal Sync Front Porch
Description: As defined by the 8701's operating system, horizontal sync delay is the period of time from the end of the last active pixel on a line to the leading edge of the horizontal sync pulse. The period is measured in one (1) pixel increments. Selecting the horizontal sync delay parameter will give you the following typical presentation on the LCD:

format00	Sync	0.401	µS
Horzntal	Delay	[40]	Pixels

This may or may not be the same as horizontal sync front porch, which is defined by the 8701's operating system as the period of time from the beginning of the line blank interval to the leading edge of the horizontal sync pulse. Plans for future versions of the operating system software call for allowing windowing and framing the active video.

You will normally need to enter a value for this parameter when setting up a new Format. For now, you may use your display's horizontal sync front porch spec as the value entered for the horizontal sync delay parameter. If your front porch specification is called out in pixels, just enter that value.

If your specification gives the front porch in microseconds, use the following procedure to obtain the desired results: 1) make sure that the values for the line rate, line active and line blank parameters are correct; 2) select the horizontal sync delay parameter; 3) rotate the knob until the delay time matches your desired value. If you cannot get the exact value required, use the nearest value that you can get to. The small remaining error (less than one pixel) will have little or no affect on your displayed image, for most displays.

Using a delay time that is too long for a particular display will cause any images that are drawn to be clipped or wrapped at the left edge of the display. Using a delay time that is too short for a particular display will cause the images to be clipped or wrapped at the right edge of the display.

Horizontal **Width**

Type: Read and Edit
Unit of Measure: Pixels
Symbol: HSPWidth
Also Called: Horiz. Sync Pulse Width
Description: Horizontal sync width is the duration of the horizontal sync pulse. Selecting the horizontal sync width parameter will give you the following typical presentation on the LCD:

format00	Sync	1.599	µS
Horzntal	Width	[40.319]	Pixels

The 8701 uses pixels as the unit of measure for horizontal sync width. Fractional values occur due to the way the pulse is generated by the current versions of the available hardware. The horizontal sync pulse width may only be changed in 2ØØ nanosecond increments.

You will normally need to enter a value for this parameter when setting up a new Format. If your pulse width specification is called out in pixels, just enter that value. Entering a value, in pixels, that is not equal to a multiple of 2ØØ nanoseconds will return the nearest pixel value that is.

If your specification gives the pulse width in microseconds, use the following procedure to obtain the desired results: 1) make sure that the values for the line rate, line active and line blank parameters are correct; 2) select the horizontal pulse width parameter; 3) rotate the knob until the time matches your desired value. If you cannot get the exact value that is required, use the nearest value that you can get that is not below the specification. Most modern CRT displays use edge triggering for their horizontal sync circuits. The slightly longer pulse will have little or no affect on such displays.

Vertical **Delay**

Type: Read and Edit
Unit of Measure: Line(s)
Symbol: ---
Also Called: Vertical Sync Front Porch
Description: As defined by the 8701's operating system, vertical sync delay is the period of time from the end of the last active pixel in a field to the leading edge of the vertical sync pulse. The period is measured in one (1) scan line increments. Selecting the vertical sync delay parameter will give you the following typical presentation on the LCD:

format00	Sync	95.238	µS
Vertical	Delay	[3]	Lines

This may or may not be the same as vertical sync front porch, which is defined by the 8701's operating system as the period of time from the beginning of the field blank interval to the leading edge of the vertical sync pulse. Plans for future versions of the operating system software call for allowing windowing and framing the active video.

For a non-interlaced Format, the vertical sync delay will always be a value that is entered. The leading edge of the vertical sync pulse will be coincident with the leading edge of the horizontal sync pulse.

For a 2:1 interlaced Format, the vertical sync delay will be exactly one half (1/2) a line longer than the entered value for every other field. The leading edge of the vertical sync pulse will be coincident with the leading edge of the horizontal sync pulse for one field and half way between the leading edges of two (2) horizontal sync pulses for the other field.

You will normally need to enter a value for this parameter when setting up a new Format. For now, you may use your display's vertical sync front porch specification as the value entered for the horizontal sync delay parameter. If your front porch specification is called out in lines, just enter that value.

If your specification gives the front porch in microseconds, use the following procedure to obtain the desired results: 1) make sure the values for line rate, field active and field blank parameters are correct; 2) select the vertical sync delay parameter; 3) rotate the knob until the delay time matches your desired value. If you cannot get the exact value that is required, use the nearest value that you can get to. The small remaining error (less than one scan line) will have little or no effect on your displayed image, for most displays.

Using a delay time that is too long for a particular display will cause any images that are drawn to be clipped or wrapped at the top edge of the display. Using a delay time that is too short for a particular display will cause the images to be clipped or wrapped at the bottom edge of the display.

Vertical **Width**

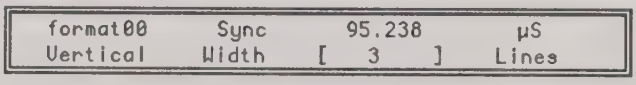
Type: Read and Edit

Unit of Measure: Line(s)

Symbol: ---

Also Called: ---

Description: Vertical sync width is the duration of the vertical sync pulse. Selecting the vertical sync width parameter will give you the following typical presentation on the LCD:



The 8701 uses lines as the unit of measure for vertical sync width. You will normally need to enter a value for this parameter when setting up a new Format. If your vertical

sync pulse width specification is called out in lines, just enter that value.

If your specification gives the front porch in microseconds, use the following procedure to obtain the desired results: 1) make sure that the values for line rate, field active and field blank parameters are correct; 2) select the vertical sync delay parameter; 3) rotate the knob until the delay time matches your desired value. If you cannot get the exact value that is required, use the nearest value that you can get to. The small remaining error (less than one scan line) will have little or no effect on your displayed image, for most displays.

Cursor H

The current version of the operating system does not support any values entered for this parameter.

Cursor V

The current version of the operating system does not support any values entered for this parameter.

Options

The parameters that are selected for editing, when the "Options" button is pressed, deal with setting up the 8701's output signals to match your display's inputs. You should be sure that the 8701 hardware you are using will support the choices you make. The documentation that comes with each video plug-in will have information on which types of outputs are supported. Selecting a choice that is not available for a particular configuration will give you an error message.

Pressing the "Options" button will give you the following "Format Option" main menu on the LCD:

```
DVSignal   DSSignal   AVSignal
DVOutput   DSOutput   AVOutput
```

The top three (3) selections, "DVSignal", "DSSignal" and "AVSignal", are referred to as high level or "Bank" selections. Selecting one of these will allow you to set up multiple video outputs with just a few keystrokes.

DVSignal

Selecting "DVSignal" will give you the following typical menu on the LCD:

```
format00    Options
DVSignal  [  RGB   ]  Gate=On      True=H
```

Three (3) parameters may be selected and changed in this menu. The first, above "Select" button 6, determines the type of digital video (none, monochrome or color) that will be generated. The second, above "Select" button 7, determines whether or not the digital video outputs are enabled as a group. The third, above "Select" button 8, determines the signal polarity of the digital video outputs as a group. The brackets around "RGB" indicate that the digital video signal type is currently selected for changing. Turning the knob will show you all of the choices for a particular selection.

The configuration shown above for FormatØØ calls for separate Red, Green and Blue digital color outputs that use a high logic level to indicate a pixel color that is turned on.

The current software supports entering the following nine (9) choices for signal type:

Void	B/W-1Bit	B/W-2Bit
B/W-4Bit	B/W-8Bit	RGB
RGBI	Rr Gg Bb	Rr Gg Bb Ii

Void indicates that the digital video signal outputs are not selected for use. If the video plug-in you are using has digital video outputs, any signals appearing on them will be of an indeterminate nature.

The **B/W-1Bit, B/W-2Bit, B/W-4Bit** and **B/W-8Bit** digital video signal types are for use with black and white (monochrome) displays that accept digital video signal(s) and convert them to shades of gray, using their own built-in digital to analog converters.

The **RGB** digital video signal type is for digital color displays that have three (3) video inputs and can show up to eight (8) different colors at one time. Each input controls one of the primary colors (Red, Green and Blue).

The **RGBI** digital video signal type is for digital color displays that have four (4) video inputs and that can show up to sixteen (16) different colors at one time. Three (3) of the

inputs are used to control the primary colors. The fourth input controls the intensity of the displayed color.

The **RrGgBb** digital video signal type is for digital color displays that have six (6) video inputs and that can show up to sixty four (64) different colors at one time. Two (2) inputs are used to control the selection and intensity of each of the primary colors.

The **RrGgBbIi** digital video signal type is for digital color displays that have eight (8) video inputs and are capable of showing up to 256 different colors at one time. Two (2) inputs are used to control each of the primary colors. Two (2) additional inputs are used to control a common intensity level.

The current software supports the following three (3) gating choices:

Gate=On Gate=Off Gate=Ind

Gate=On indicates that the digital video signal outputs, as a group, are enabled.

Gate=Off indicates that the digital video signal outputs, as a group, are disabled.

Gate=Ind indicates that the gating of the digital video signal outputs is being controlled on an individual basis in the DVOutput menu. Turning the knob to "Gate=On" or "Gate=Off" will cancel any individual settings.

The gate setting is independent of the "Outputs" switch status. Turning the "Outputs" off will disable all of the outputs regardless of the actual gate setting. Turning the "Outputs" on will enable all of the outputs that are "gated" on.

The current software supports the following three (3) logic level choices:

True=H True=L True=Ind

True=H indicates that the digital video signal outputs, as a group, use a high logic level to indicate active video.

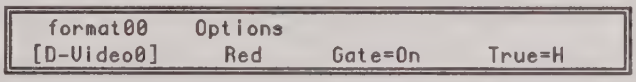
True=L indicates that the digital video signal outputs, as a group, use a low logic level to indicate active video.

True=Ind indicates that the logic levels of the digital video signal outputs is being controlled on an individual basis in the DVOutput menu. Turning the knob to "True=H" or "True=L" will cancel any individual settings.

Some video plug-ins may not have digital video outputs or may not allow individual control of their outputs. The documentation in the Video Plug-Ins chapter contains information on which digital video signal configurations are supported by a particular type of plug-in. Attempting to select a digital video configuration that is not supported by the video plug-in will result in an error message. The documentation will also have information on how to connect your display to the signal outputs.

DVOutput

Configuration information for the individual digital video outputs may be found by going to the main options menu, by pressing "Options", and selecting "DVOutput" from the menu, giving you the following typical sub-menu on the LCD:



The brackets around "D-VideoØ" indicate that the digital video channel number is selected for changing. By selecting the channel number, and turning the knob, you can see all of the settings for each of the channels. The current version of the operating system software supports eight (8) digital video channels (numbered Ø-8) and each channel has its own unique set of parameters for type, gating and logic level. By selecting the channel number, and turning the knob, you can see all of the settings for each of the eight channels.

Three (3) parameters may be selected and changed for each channel. The first, above "Select" button 6, determines the digital video signal type that will be generated by that channel. The second, above "Select" button 7, determines whether or not the channel is enabled. The third, above "Select" button 8, determines the signal polarity of the channel. The settings for all of the channels are normally changed as a group, using the "DVSignal" Options sub-menu.

The current software supports the following 17 signal types for the individual channels:

Void	BitØ	Bit1	Bit2
Bit3	Bit4	Bit5	Bit6
Bit7	Red	R-Prime	Green
G-Prime	Blue	B-Prime	Intense
I-Prime			

Void indicates that the digital video signal channel is not selected for use. If the video plug-in you are using has digital video outputs, any signals appearing on them will be of an indeterminate nature.

BitØ, Bit1, Bit2, Bit3, Bit4, Bit5, Bit6 and **Bit7** indicate which binary bit is assigned to a channel when **B/W-1Bit, B/W-2Bit, B/W-4Bit** or **B/W-8Bit** video is selected in the "DVSignal" Options sub-menu.

Red, Green and **Blue** indicate which color is assigned to a channel when **RGB, RGBI, RrGgBb** or **RrGgBbIi** video is selected in the "DVSignal" Options sub-menu.

Intense indicates which channel is assigned the intensity output when **RGBI** or **RrGgBbIi** video is selected in the "DVSignal" Options sub-menu.

R-Prime, G-Prime and **B-Prime** indicate which channel is assigned the least significant bit of each color when **RrGgBb** or **RrGgBbIi** video is selected in the "D-Signal" Options sub-menu.

I-Prime indicates which channel is assigned the least significant bit of the intensity output when **RrGgBbIi** video is selected in the "DVSignal" Options sub-menu.

Due to various hardware and software constraints, certain channels may not be able to output certain types of signals. For best results, use the default settings as determined by the "DVSignal" selection.

The current software supports the following two (2) gating choices for the individual channels:

Gate=On Gate=Off

Gate=On indicates that the digital video channel is enabled.

Gate=Off indicates that the digital video channel is disabled.

The gate setting is independent of the "Outputs" switch status. Turning the "Outputs" OFF will disable all of the outputs regardless of the actual gate setting. Turning the "Outputs" ON will enable all of the outputs that are "gated" on.

The current software supports the following two (2) logic level choices for the individual channels:

True=H True=L

True=H indicates that the digital video signal channel uses a high logic level to indicate active video.

True=L indicates that the digital video signal channel uses a low logic level to indicate active video.

AVSignal

Selecting "AVSignal" will give you the following typical menu on the LCD:

```
format00   Options
AVSignal [ RGB  ] Gate=On    True=Ind
```

Three (3) parameters may be selected and changed in this menu. The first, above "Select" button 6, determines the type of analog video (none, monochrome or color) that will be generated. The second, above "Select" button 7, determines whether or not the analog video outputs are enabled (gated) as a group. The third, above "Select" button 8, determines whether or not composite sync is added to the analog video outputs, as a group. The brackets around "RGB" indicate that the analog video signal type is currently selected for changing. Turning the knob will show you all of the choices for a particular selection.

The configuration shown above for FormatØØ calls for separate Red, Green and Blue analog color outputs and that the addition of composite sync is being controlled on an individual channel basis.

The current software supports the following three (3) choices for signal type:

Void B/W RGB

Void indicates that the analog video signal outputs are not selected for use. If the video plug-in you are using has analog video outputs, any signals appearing on them will be of an indeterminate nature.

The **B/W** analog video signal type is for analog monochrome displays.

The **RGB** analog video signal type is for analog color displays that use separate Red, Green and Blue analog video inputs.

The current software supports the following three (3) video gating choices:

Gate=On Gate=Off Gate=Ind

Gate=On indicates that the analog video signal outputs, as a group, are enabled.

Gate=Off indicates that the analog video signal outputs, as a group, are disabled.

Gate=Ind indicates that the gating of the analog video signal outputs is being controlled on an individual basis in the A-Video menu. Turning the knob to "Gate=On" or "Gate=Off" will cancel any individual settings.

The gate setting is independent of the "Outputs" switch status. Turning the "Outputs" OFF will disable all of the outputs regardless of the actual gate setting. Turning the "Outputs" ON will enable all of the outputs that are "gated" on.

The current software supports the following three (3) composite sync choices:

Sync=On Sync=Off Sync=Ind

Sync=On indicates that composite sync is added to all of the analog video signal outputs that are enabled.

Sync=Off indicates that composite sync is not added to any of the analog video signal outputs.

Sync=Ind indicates that the addition of composite sync to the analog video signal outputs is being controlled on an individual basis in the A-Video menu. Turning the knob to "Sync=On" or "Sync=Off" will cancel any individual settings.

Some video plug-ins may not have analog video outputs or may not allow individual control of their outputs. The Video Plug-Ins chapter contains information on which analog video signal configurations are supported by a particular type of plug-in. Attempting to select an analog video configuration that is not supported by the video plug-in will result in an error message. The documentation will also have information on how to connect your display to the signal outputs.

AVOutput

Configuration information for the individual analog video outputs may be found by going back to the main options menu, pressing "Options", and selecting "AVOutput" from the menu. Selecting "AVOutput" will give you the following typical sub-menu on the LCD:

```
 format00   Options
[A-Video0]    Red     Gate=On    Sync=Off
```

The brackets around "A-VideoØ" indicate that the analog video channel number is selected for changing. By selecting the channel number, and turning the knob, you can see all of the settings for each of the channels. The current version of the operating system software supports three (3) analog video channels (numbered Ø-2). Each channel has its own unique set of parameters for type, gating and sync control. By selecting the channel number, and turning the knob, you can see all of the settings for each of the three channels.

Three (3) parameters may be selected and changed for each channel. The first, above "Select" button 6, determines the analog video signal type that will be generated by that channel. The second, above "Select" button 7, determines whether or not the channel is enabled. The third, above "Select" button 8, determines whether composite sync is added to the channel. The settings for all of the channels are normally changed as a group, using the "AVSignal" Options sub-menu.

The current software supports the following five (5) choices for signal type:

Void Red Green Blue Gray

Void indicates that the analog video channel is not selected for use. If the video plug-in you are using has analog video outputs, any signals appearing on them will be of an indeterminate nature.

Red, Green and **Blue** indicate which color is assigned to an analog channel when **RGB** video is selected in the "AVSignal" Options sub-menu.

Gray indicates that the analog video channel is assigned to a monochrome output when **B/W** video is selected in the "AVSignal" Options sub-menu.

The current software supports the following two (2) gating choices for the individual channels:

Gate=On Gate=Off

Gate=On indicates that the analog video channel is enabled.

Gate=Off indicates that the analog video channel is disabled.

The gate setting is independent of the "Outputs" switch status. Turning the "Outputs" off will disable all of the outputs regardless of the actual gate setting. Turning the "Outputs" on will enable all of the outputs that are "gated" on.

The current software supports the following two (2) sync gating choices for the individual channels:

Sync=On Sync=Off

Sync=On indicates that composite sync is added to the analog video channel.

Sync=Off indicates that composite sync is not added to the analog video channel.

DSOutput

Configuration information for the individual digital sync outputs may be found by going to the main options menu, by pressing "Options", and selecting "DSOutput" from the menu. Selecting "D-Sync" will give you the following typical sub-menu on the LCD:

```
format00   Options
[D-Sync0]     HS      Gate=On      True=H
```

The brackets around "D-SyncØ" indicate that the digital sync channel number is selected for changing. By selecting the channel number, and turning the knob, you can see all of the settings for each of the channels. The current version of the operating system software supports up to four (4) digital sync channels (numbered Ø-3). Each channel has its own unique set of parameters for type, gating and logic level. By selecting the channel number, and turning the knob, you can see all of the settings for each of the eight channels.

Three (3) parameters may be selected and changed for each channel. The first, above "Select" button 6, determines the digital sync signal type that will be generated by that channel. The second, above "Select" button 7, determines whether or not the channel is enabled. The third, above "Select" button 8, determines the signal polarity of the channel.

Attempting to select a digital sync configuration that is not supported by the hardware configuration you are using will result in an error message.

The current software supports the following ten (10) choices for signal type:

Void	HS	VS	CS-ORed
CS-SH	CS-SF	CS-SF2	CS-SF2EQ
FS	PelClock		

Void indicates that the digital sync channel is not selected for use.

HS indicates that Horizontal Sync is assigned to the digital sync channel.

VS indicates that Vertical Sync is assigned to the digital sync channel.

CS-ORed indicates that Composite Sync, consisting of the individual Vertical and Horizontal Sync waveforms combined with an "OR" gate, is assigned to the the digital sync channel.

The other "CS-" choices require that the 8701 have EIA sync hardware installed. 8701 mainframes that have the hardware installed will have a sticker on the back of the chassis indicating that fact. Please see the "Specifications" section of the appendices for more information on the types of signal available.

FS indicates that Field Sequential Sync is assigned to the digital sync channel.

PelClock indicates that Pixel Clock is assigned the digital sync channel.

The current software supports the following two (2) gating choices for the individual channels:

Gate=On Gate=Off

Gate=On indicates that the digital sync channel is enabled.

Gate=Off indicates that the digital sync channel is disabled.

The gate setting is independent of the "Outputs" switch status. Turning the "Outputs" OFF will disable all of the outputs regardless of the actual gate setting. Turning the "Outputs" ON will enable all of the outputs that are "gated" on.

The current software supports the following two (2) logic level choices for the individual channels:

True=H True=L

True=H indicates that the digital sync signal channel uses a high logic level to indicate the active state of the signal.

True=L indicates that the digital sync signal channel uses a low logic level to indicate the active state of the signal.

Outputs

This button enables and disables all of the signal outputs of the FOX as a group. All independent gating options are temporarily overridden whenever the outputs of the FOX are disabled using this key. The LED located directly above this key will be lit whenever the outputs of the FOX are enabled. The "Outputs" status of a Format is saved along with all the other Format parameters, when you save a Format. The 8701's outputs will revert to the saved state when the Format is loaded later.

Select Buttons and LCD

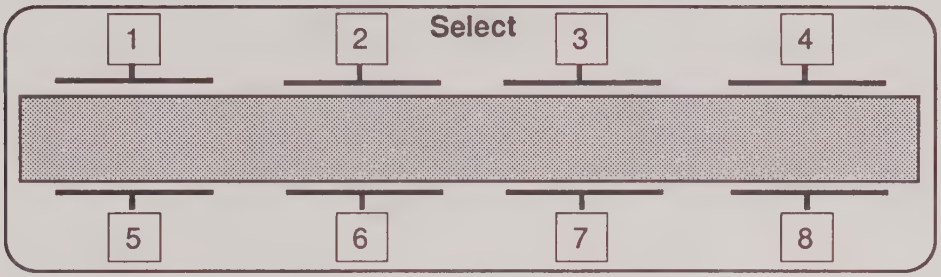


Figure 5-8 Front Panel "Select" Group

Figure 5-8 shows the "Select" group of the 8701's front panel. The function of each of the eight (8) buttons is software programmable. The buttons are located adjacent to a Liquid Crystal Display (LCD) so that words, appearing on the LCD, can be used as labels to indicate the current function of each button.

The LCD lets the 8701 communicate with the user. Up to 80 characters (2 rows with 40 characters per row) can be displayed at one time. Most of the time, the LCD is used to label the eight (8) select buttons, as shown in following example of a Macro's menu:

```
Eject      Clock     DiskCopy  DiskInit
Install
```

In this example button 1 is labeled "Eject". Pressing the button would cause the disk to be ejected from the disk drive. Pressing button 2 would start the procedure for setting the real-time clock. Buttons 6, 7 and 8 have no functions associated with them in the Macro's menu.

The LCD is also used to give error and warning messages to the user. The 8701 operating system also uses the LCD to have "Dialogs" with the user. These dialogs appear whenever the 8701 needs additional information or a decision from the user.

The LCD has an electroluminescent backlight. The 8701 uses special hardware and software to extend the life of the backlight. Whenever no front panel activity (button pushing or knob turning) has been detected for about ten (10) minutes, the backlight is turned off. The backlight will be turned back on whenever any button is pushed or the knob is turned.

Show Buttons

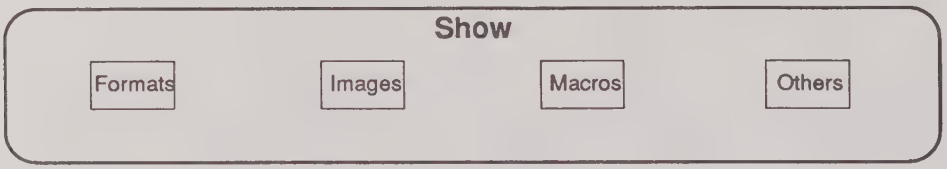


Figure 5-9 Front Panel "Show" Group

Figure 5-9 shows the "Show" group of the 8701's front panel. These buttons control the type of function displayed on the LCD. They allow you to rapidly switch your attention from one aspect of 8701 operations to another with a single key stroke.

Formats

The "Formats" button gives you access to all of the Formats stored on a disk. A typical display on the LCD, after pressing "Formats" would be similar to the following:

```
  format00   format01   format05    format
[format16]   format22   format25   format34
```

The brackets around one of the Formats indicate that the particular format is currently loaded into the 8701. If more than eight (8) Formats exist on the disk, the LED next to the knob will be lit. In such cases, the list of available Formats may be scrolled through the LCD by turning the knob. Pressing the "Select" button will cause the Format associated with that button to be loaded. Attempting to select another Format after making changes in the current Format will start a dialog on the LCD concerning disposition of the changed Format.

Additional information on selecting and loading Formats may be found in the Operating Tasks chapter.

Images

The "Images" button gives you access to all of the "Instant-Expert" and demo images. The LCD displays the following menu after the "Images" button is pressed:

DEMO	GENERAL	SPECIAL	CUSTOM
SETUP	GEOMETRY	COLOR	FINAL

This is the top level or "main" images menu. All image menu items that are written in all CAPITAL LETTERS indicate that selecting one of those items will call up another menu instead of drawing an image.

Selecting any item in the main menu, except "CUSTOM", will call up menus that relate to built-in images. Most of these are self-scaling test patterns that have been predefined by Quantum Data. These are called "Instant-Expert Images". The user can change little or nothing in the way that most of them are drawn. Other built-in images are "Demo" images. These images, some including animation, may be used to demonstrate your displays to customers or for running your displays at trade shows. Some of the "Demo" choices continuously cycle through groups of images.

Selecting "CUSTOM" from the main images menu calls up a menu of user-created images. The images are saved on disk as named Image files, having a file extension of "`.img`". The disk containing the operating system software comes with a default Image file called "newimage".

Built-In Images

The current version of the operating system software includes a set of over sixty (60) self-scaling "Instant-Expert" test images. There is a separate chapter in this manual that describes each of the images and, in many cases, gives examples of how they may be used to evaluate and adjust your displays. Some images have one or more editable attributes. The descriptions will list these attributes. An "Images" tree diagram is provided in the appendix. The diagram shows how the various images and sub-menus are linked together. The diagram also points out images that have editable attributes.

A section in the "Operating Tasks" chapter shows you how to call up a built-in image and change it's attributes.

Custom Images

The current version of the operating system software allows you to create self-scaling custom images that consist of one or more simple drawing primitives. The following primitives are currently available:

Box	Ctr-Mark	Grid	Limits	Oval
Chars	Dot	H-Grill	Line	V-Grill

The current version of the operating system software allows you to assign a predefined drawing color or shade of gray to each individual primitive. The following standard colors and shades of gray are currently available for Analog Video Formats having a depth of 8 bits-per-pixel:

Black	Red	Green	Blue	Yellow
Cyan	Magenta	5% Gray	10% Gray	20% Gray
30% Gray	40% Gray	50% Gray	60% Gray	70% Gray
80% Gray	90% Gray	95% Gray	100% White	

The Image editor always allows you to assign any of the listed colors to a primitive. The assigned colors will be correct when the Image is drawn using Formats that have a depth of 8 bits-per-pixel. At lower pixel depths, the number of available colors is reduced. This will cause two or more different assigned colors to be drawn with the same color. The worst case situation is when the depth is one bit-per-pixel. In which case all assigned colors, except for black, will be drawn in white. This means that if you wish to create Images to draw at various pixel depths, you should only use the colors that are available at the lowest depth. The following chart shows what colors will be actually drawn if the Image is drawn at a reduced pixel depth:

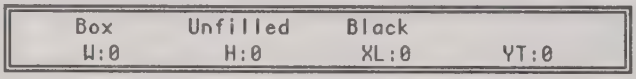
Selected Color	Image File Color No.	Color @ 8 Bits-per-Pixel	Color @ 4 Bits-per-Pixel	Color @ 2 Bits-per-Pixel	Color @ 1 Bit-per-Pixel
Black	Ø	Black	Black	Black	Black
Red	1	Red	Red	5Ø% Gray	White
Green	2	Green	Green	5Ø% Gray	White
Yellow	3	Yellow	Yellow	5Ø% Gray	White
Blue	4	Blue	Blue	5Ø% Gray	White
Magenta	5	Magenta	Magenta	5Ø% Gray	White
Cyan	6	Cyan	Cyan	5Ø% Gray	White
White	7	White	White	White	White
5% Gray	8	5% Gray	Black	5Ø% Gray	White
1Ø% Gray	9	1Ø% Gray	Black	5Ø% Gray	White
2Ø% Gray	1Ø	2Ø% Gray	Black	5Ø% Gray	White
3Ø% Gray	11	3Ø% Gray	3Ø% Gray	5Ø% Gray	White
4Ø% Gray	12	4Ø% Gray	4Ø% Gray	5Ø% Gray	White
5Ø% Gray	13	5Ø% Gray	5Ø% Gray	5Ø% Gray	White
6Ø% Gray	14	6Ø% Gray	6Ø% Gray	5Ø% Gray	White
7Ø% Gray	15	7Ø% Gray	7Ø% Gray	5Ø% Gray	White
8Ø% Gray	16	8Ø% Gray	8Ø% Gray	5Ø% Gray	White
9Ø% Gray	17	9Ø% Gray	9Ø% Gray	5Ø% Gray	White
95% Gray	18	95% Gray	White	5Ø% Gray	White

The numbers in the second column are the color code numbers that are stored in an Image file. These are the first numbers that appear in each when you list the contents of an Image file.

A section in the "Operating Tasks" chapter shows you how to create a custom Image. Information is provided in that section on how to select an Image for editing and how to edit some of the individual primitives. We will be presenting information on all of the primitives in this section of the manual as well as information on how the primitives are stored in Image files.

Box Primitive

The parameter sub-menu for the "Box" primitive is shown here:



You may chose to have the box drawn as a one pixel thick outline by selecting "**Unfilled**". You may draw the box as a solid by selecting "**Filled**". You may draw the box using any of the standard colors or shades of gray. The "**W:**" parameter defines the

width of the box in pixels. The "**H:**" parameter defines the height of the box in lines. The "**XL:**" parameter defines the horizontal position of the box in pixels. The horizontal position is defined as the offset from the left edge of active video to the left edge of the box. The "**YT:**" parameter defines the vertical position of the box in scan lines. The vertical position is defined as the offset from the top edge of active video to the top edge of the box.

Chars Primitive

The parameter sub-menu for the "Chars" primitive is shown here:

The "Chars" primitive draws a patch of characters over a given area of the active video. You may draw the characters using any of the standard colors or shades of gray. Seven fonts, numbered Ø through 6, are currently available. The fonts come in several sizes and typefaces. In general, the larger the number of the font, the larger the character size will be. Font number 2 contains only two characters (character number 68 & 69) which are designed for checking a display's focus characteristics. The remaining fonts contain a full upper and lower case alphabet, numbers and various punctuation marks. The font number is selected by the "**Font:**" parameter and the character number within the font is selected by the "**Char:**" parameter. The character number closely follows the standard ASCII character codes. No additional information on the fonts is available at this time.

The the position of the top left-hand corner of the patch may be defined by the user. The bottom right-hand corner of the characters is the same as the bottom right-hand corner of the active video area. The "**XL:**" parameter defines the horizontal position of the patch in pixels. The horizontal position is defined as the offset from the left edge of active video to the left edge of the patch. The "**YT:**" parameter defines the vertical position of the patch in scan lines. The vertical position is defined as the offset from the top edge of active video to the top edge of the patch. The inter-character spacing is determined the size of the individual character block. The "**BW:**" parameter defines the width of the character block in pixels. The "**BH:**" parameter defines the height of the character block in scan lines. The size of the character block does not scale to different formats.

Ctr-Mark Primitive

The parameter sub-menu for the "Ctr-Mark" primitive is shown here:

The center mark primitive is a small cross in the center of the active video. If there are an even number of active pixels per line, the vertical line in the cross is drawn two pixels thick. If there are an even number of active lines per frame, the horizontal line in the cross is drawn two scan lines thick. You may draw the cross using any of the standard colors or shades of gray.

Dot Primitive

The parameter sub-menu for the "Dot" primitive is shown here:

The "Dot" is a single pixel dot that can be placed anywhere in the active video. You may draw the dot using any of the standard colors or shades of gray. The position of the dot is determined by its "**X1:**" and "**Y1:**" coordinates.

Grid Primitive

The parameter sub-menu for the "Grid" primitive is shown here:

The "Grid" primitive draws a centered grid pattern consisting of of equally sized boxes. The number of boxes horizontally, "**HBox:**", and vertically, "**VBox:**" may be individually programmed. You may draw the grid using any of the standard colors or shades of gray.

H-Grill Primitive

The parameter sub-menu for the "H-Grill" primitive is shown here:

The "H-Grill" primitive fills the active video area with alternating horizontal bars that are the full width of the active video. The "Off" bars are transparent, relative to any previously drawn items, and the "On" bars are drawn with the color that is selected in the sub-menu. The thickness of the bars is controlled by the "**On:**" and "**Off:**" parameter values. The values are entered in terms of scan lines and do not scale to different Formats.

Limits Primitive

The parameter sub-menu for the "Limits" primitive is shown here:

The "Limits" primitive draws nine (9) markers in the active video area. The markers define the corners of active video (4 markers), the center of each edge of active video (4 markers) and the center of active video. You may draw the limits markers using any of the standard colors or shades of gray.

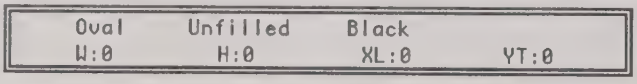
Line Primitive

The parameter sub-menu for the "Line" primitive is shown here:

The "Line" primitive lets you draw a one pixel thick line between any two points in the active video area. The coordinates of the starting point are defined by the "**X1:**" and "**Y1:**" parameters. The coordinates of the end point are defined by the "**X2:**" and "**Y2:**" parameters. You may draw a line using any of the standard colors or shades of gray.

Oval Primitive

The parameter sub-menu for the "Oval" primitive is shown here:



An oval is defined by a rectangular frame that circumscribes it (a rectangle around the outside of the oval that just touches the oval at four points). The width and height of the oval is equal to the width and height of the framing rectangle. The width and height are entered into the "**W:**" and "**H:**" parameters. The location of the oval is specified by the coordinates of the top left corner of the framing rectangle. The position coordinates are entered into the "**XL:**" and "**YT:**" parameters. You may draw the oval using any of the standard colors or shades of gray.

V-Grill Primitive

The parameter sub-menu for the "V-Grill" primitive is shown here:

The "V-Grill" primitive fills the active video are with alternating vertical bars that are the full height of the active video. The "Off" bars are transparent, relative to any previously drawn items, and the "On" bars are drawn with the color that is selected in the sub-menu. The thickness of the bars is controlled by the "**On:**" and "**Off:**" parameter values. The values are entered in terms of pixels and do not scale to different Formats.

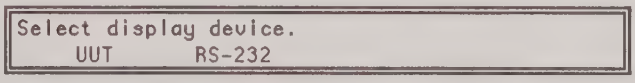
Custom Image File Structure

As previously mentioned, most of the parameters that deal with a primitive's size and position are self-scaling. This is possible due to the fact that all points in the image are scaled to an internal grid that is 10,000 points wide and 10,000 points high. When you edit an Image using the Image editor, the conversion between units of measure is performed for you. For example, let's say that you created an Image using a Format that had 1280 active pixels per line and 1024 active lines per frame. A point half way across the screen and one fourth the way down would have its coordinates shown in the menu as having an X value of 640 pixels and a Y value of 256 lines. The coordinate would be stored in the Image file as having an X value of 5000 (1/2 of 10,000) and a Y value of 2500 (1/4 of 10,000). Listing the contents of an Image file shows you exactly how the data is stored. Additional parameters such as color and whether to draw as a filled or unfilled object are also in the file. Each item in an Image file takes up one line of text.

Image files are stored on the disk as MS-DOS compatible ASCII text files. The file extension used is ".img". Certain text editors and utility programs that run on an IBM-PC may be able to read the files and list them on the computer's screen. Creating and editing Image files directly on the PC is currently beyond the scope of this manual.

Listing Custom Image Files

You can list the contents of an Image file to either the screen of the unit under test or to a printer through the 8701's RS-232C port. To list the contents of an Image, select the file for editing then select "List" from the Editor sub-menu. The following dialog will then appear on the LCD:



To list the file to the screen of your display, select "UUT". If you entered and saved the sample custom image described in "Operating Tasks", its listing would look like this:

```
( Contents of image file:    cstm_1)
1 !IMAGE_VERSION

Ø 1 1ØØØØ 1ØØØØ Ø Ø IBOX
```

```
7 3 16 22 5ØØØ 5ØØØ 69 ICHARS
1 1 25ØØ 25ØØ Ø Ø IBOX
2 1 25ØØ 25ØØ 125Ø 125Ø IBOX
4 1 25ØØ 25ØØ 25ØØ 25ØØ IBOX
7 Ø 375Ø 5ØØØ 5625 Ø IOVAL
7 Ø 1875 25ØØ 6563 1250 IOVAL
7 0 1ØØØØ 1ØØØØ Ø Ø IBOX
```

To list the file contents to printer, you need a printer that has an RS-232C serial port, supports 4800 baud data rates and can print at least 80 characters per row. Additional specifications for RS-232C port will be found in another section of this chapter. Selecting "RS-232" in the previously shown menu will direct the listing to the printer.

Macros

The Macros button gives you access to many of the other functions, besides generating sync and video, available on the 8701. With the current version of the operating system software, pressing the "Macros" button gives you the following choices on the LCD:

To run any of the Macro functions shown in the menu, press the "Select" button next to the Macro name. The current version of the operating system software supports five (5) functions, as shown on the LCD. A brief explanation of each of the functions follows. The chapter on Operating Tasks, in this manual, contains detailed information on what each of the functions does and how to use them.

Eject

Selecting this function will cause any disk that is in the 8701's disk drive to be ejected. If you have any files open, you will be told to close them first.

DiskCopy

This function allows you to duplicate the entire contents of a disk. You will be prompted when to insert the source and destination disks. Any existing files on the destination disk will be lost. If you are using an unformatted blank disk as the destination disk, it must first be initialized using the "DiskInit" Macro.

DiskInit

This function allows you to initialize a disk. A disk must be initialized before it can be used by the 8701 for storing files. You will be prompted when to insert the disk. Any existing files on the disk will be lost during the initialization process. The initialization routine will make the disk's files and directories MS-DOS compatible. This routine does not install the operating system onto the disk.

Clock

This function allows you to change the current time and date settings of the 8701's internal time keeping circuit. The time and date are automatically used to mark revisions to files when they are saved.

Install

Selecting this function allows you to match the operating system software to the particular video plug-in you are currently using.

Others

The current version of the operating system software does not use this button.

RS-232C Port

The 8701 comes with one (1) RS-232C serial port supplied.

The current version of the standard operating system software only supports listing the contents of Image files to a printer via this port.

The communications protocol is as follows:

Data Rate:	4800 Baud
Data Bits:	8
Stop Bits:	1
Parity:	None
Handshaking:	None

The port uses a female DB-25 connector located on the rear I/O panel. The connector is configured as follows:

Serial Data Out:	Pin 2
Serial Data In:	Pin 3 (for future use)
Ground:	Pin 1 and 25

HIA Port

The external Host Interface Adaptor (HIA) port will allow you to operate the 8701 from an external computer, as if it were a FOX model 8700. The computer must have the correct HIA card, cable and software installed. These items may be purchased from Quantum Data as user-installed option packages. Certain IBM personal computers and clones are currently supported. A separate user's manual covering installation and operations is supplied with the packages.

The current version of the operating system works a bit differently than previous releases. The external HIA port is normally always active except for brief moments when images are being drawn from the front panel or Format parameters are being accessed by the front panel.

Error #	Problem:	Possible Cure(s):
2090	Line active plus line blank must be an even number.	The plug-in you are using does not allow an odd number of pixels for the "Line Period" parameter. You may be using the wrong plug-in. Change either the line active or line blank to give an even total.
2100	Too many total pixels on a line.	The value of the "Line Period" parameter (in pixels) is too large. Decrease the value of the "Line Period" parameter.
2110	Not enough total pixels on a line.	Due to certain system constraints, the value of the "Line Period" parameter (in pixels) is too small. Increase the value of the "Line Period" parameter.
2140	Minimum line blank constraint not met.	Due to certain system constraints, the value of the "Line Blank" parameter (in pixels) is too small. Increase the value of the "Line Blank" parameter.
2150	Line blank must be greater than 1.2 microseconds.	The absolute minimum value allowed for "Line Blank" is 1.2 µS. Increase the value of the "Line Blank" parameter to more than 1.2 µS.
2151	Line blank interval not long enough.	Due to certain system constraints, the minimum value for the "Line Blank" parameter is more than absolute lowest limit of 1.2 µS. Increase the value of the "Line Blank" parameter.
2160	Analog sync channel does not exist.	The plug-in you are using cannot be programmed to put sync on the specified analog channel or the analog channel does not exist on that plug-in. Change channel selection under "A-Video" or "A-Signal" in the "Options" menu or use a different plug-in.

Error #	Problem:	Possible Cure(s):
2171	Analog sync channels must be gated by bank.	The plug-in you are using does not allow independent gating of the analog sync channels. Change channel gating selection under "A-Video"in the "Options" menu or use a different plug-in.
2180	Horizontal sync pulse width is too small.	Increase the value of the "Horizontal Sync Width" parameter.
2181	Horizontal sync pulse width is too small for sync type selected.	Increase the value of the "Horizontal Sync Width" parameter. Select the correct sync type.
2190	Horizontal sync pulse width is too large.	The value of the "Horizontal Sync Width" parameter is greater than the value of the "Line Period" parameter. Decrease the value of the "Horizontal Sync Width" parameter.
2200	Horizontal sync pulse must stay within the line blank interval when analog sync is enabled.	At least one (1) analog sync channel is gated on and the value of the "Horizontal Sync Width" parameter is greater than the "Line Blank" parameter. This would cause a portion of the sync pulse to overlap with active video. Decrease the value of the "Horizontal Sync Width" parameter and / or increase the value of the "Line Blank" parameter or separate digital sync may be called for.
2220	Horizontal sync delay is too long.	The value of the "Horizontal Sync Delay" parameter is greater than the value of the "Line Period" parameter. Decrease the value of the "Horizontal Sync Delay" parameter.
2230	Horizontal sync pulse must stay within the line blank interval when analog sync is enabled.	At least one (1) analog sync channel is gated on and the combination of the values for the "Horizontal Sync Width", "Horizontal Sync Delay" and "Line Blank" parameter would cause some portion of the sync pulse to overlap with active video. Decrease the value of the "Horizontal Sync Width" parameter, decrease the value of the "Horizontal Sync Delay" parameter, increase the value of the "Line Blank" parameter or use separate digital sync output.

Error #	Problem:	Possible Cure(s):
2233	Horizontal sync delay is too short.	Due to certain system constraints, the value of the "Horizontal Sync Delay" parameter (in pixels) is too small. Increase the value of the "Horizontal Sync Delay" parameter.
2234	Horizontal sync delay is excessive.	Due to certain system constraints, the value of the "Horizontal Sync Delay" parameter (in pixels) is too large. Decrease the value of the "Horizontal Sync Delay" parameter.
2235	Horizontal sync delay is excessive.	Due to certain system constraints, the value of the "Horizontal Sync Delay" parameter (in pixels) is just a bit too small. Slightly increase the value of the "Horizontal Sync Delay" parameter.
2237	Horizontal sync delay is too long.	Due to certain system constraints, the value of the "Horizontal Sync Delay" parameter (in pixels) is just a bit too large. Decrease the value of the "Horizontal Sync Delay" parameter or decrease the value of the "Horizontal Sync Width" parameter.
2240	There must be at least two lines in a field.	A field must consist of at least one (1) active and one (1) blanked scan line. Increase the value of the "Field Period" parameter by increasing the values of the "Field Active" and / or the "Field Blank" parameter(s).
2250	Field active plus Field blank must total at least 5 lines.	Due to certain system constraints, the minimum value for the "Field Period" parameter is 5 lines. Increase the value of the "Field Period" parameter to at least 5 lines by increasing the values of the "Field Active" and / or the "Field Blank" parameter(s).
2260	Field active plus Field blank must total at least 7 lines.	Due to certain system constraints, the minimum value for the "Field Period" parameter is 7 lines. Increase the value of the "Field Period" parameter to at least 7 lines by increasing the values of the "Field Active" and / or the "Field Blank" parameter(s).

Error #	Problem:	Possible Cure(s):
2270	The sum of Field active plus Field blank must be an odd number.	Due to certain system constraints, the value for the "Field Period" parameter must be an odd number. Change the value of the "Field Period" parameter to an odd number by changing the values of the "Field Active" and / or the "Field Blank" parameter(s).
2280	Field active plus Field blank must total less than 65535 lines.	Due to system constraints, the maximum value for the "Field Period" parameter is 65535 lines. Decrease the value of the "Field Period" parameter to less than 65535 lines by decreasing the values of the "Field Active" and / or the "Field Blank" parameter(s) or go to an interlaced format.
2290	Field active plus Field blank must total less than 131072 lines.	Due to system constraints, the maximum value for the "Field Period" parameter is 131072 lines. Decrease the value of the "Field Period" parameter to less than 131072 lines by decreasing the values of the "Field Active" and / or the "Field Blank" parameter(s).
2300	Field active must be at least 1 line.	A usable display must have at least one (1) line of active video. Increase the value of the "Field Active" parameter to more than 0 lines.
2310	Not enough field blanking.	Due to system constraints, the value of the "Field Blank" parameter is too small. Increase the value of the "Field Blank" parameter.
2320	There must be at least 1 active line per field.	A usable interlaced display must have at least one (1) line of active video per field. Increase the value of the "Field Active" parameter to more than 0 lines.
2321	Frame active must be even when in interlace.	Due to system constraints, the value of the "Frame Active" parameter must be even when interlacing. Change the value of the "Frame Active" parameter to an even number of lines.

Error #	Problem:	Possible Cure(s):
2330	Not enough field blanking.	Due to system constraints, the value of the "Field Blank" parameter is too small. Increase the value of the "Field Blank" parameter.
2340	Not enough field blanking.	Due to system constraints, the value of the "Field Blank" parameter is too small. Increase the value of the "Field Blank" parameter.
2350	Vertical sync pulse must be at least one line.	The minimum value for the "Vertical Sync Width" is one (1) line. Increase the value of the "Vertical Sync Width" parameter to more than zero (0) line.
2360	Vertical sync pulse width is too large.	The value of the "Vertical Sync Width" parameter is greater than the value of the "Field Period" parameter. Decrease the value of the "Vertical Sync Width" parameter.
2370	Vertical sync pulse width is too large.	At least one (1) analog sync channel is gated on and the value of the "Vertical Sync Width" parameter is greater than the "Field Blank" parameter. This would cause a portion of the sync pulse to overlap with active video. Decrease the value of the "Vertical Sync Width" parameter and / or increase the value of the "Field Blank" parameter or separate digital sync may be called for.
2380	Vertical sync pulse width is too large.	Due to certain system constraints, the value of the "Vertical Sync Width" parameter (in lines) is too large. Decrease the value of the "Vertical Sync Width" parameter.
2390	Vertical sync pulse width is too large.	Due to certain system constraints, the value of the "Vertical Sync Width" parameter (in lines) is too large. Decrease the value of the "Vertical Sync Width" parameter.

Error #	Problem:	Possible Cure(s):
2410	Vertical sync delay must be at least 1 line when in interlace.	Increase the value of the "Sync \ Vertical \ Delay" parameter to more than 0 or when interlaced operation is required.
2420	Vertical sync delay is too large.	The value of the "Vertical Sync Delay" parameter is greater than the value of the "Field Period" parameter. Decrease the value of the "Vertical Sync Delay" parameter.
2430	Vertical sync pulse must stay within vertical blank interval.	At least one (1) analog sync channel is gated on and the combination of the values for the "Vertical Sync Width", "Vertical Sync Delay" and "Field Blank" parameter would cause some portion of the sync pulse to overlap with active video. Decrease the value of the "Vertical Sync Width" parameter, decrease the value of the "Vertical Sync Delay" parameter, increase the value of the "Field Blank" parameter or use separate digital sync output.
2440	Vertical sync delay is too large.	Due to certain system constraints, the value of the "Vertical Sync Width" parameter (in lines) is too large. Decrease the value of the "Vertical Sync Width" parameter.
2450	Vertical sync pulse must stay within vertical blank interval.	At least one (1) analog sync channel is gated on and the combination of interlaced operation along with the values for the "Vertical Sync Width", "Vertical Sync Delay" and "Field Blank" parameter would cause some portion of the sync pulse to overlap with active video. Decrease the value of the "Vertical Sync Width" parameter, decrease the value of the "Vertical Sync Delay" parameter, increase the value of the "Field Blank" parameter or use separate digital sync output.
2510	Not enough memory to support combination of Line Active and Pixel Depth.	Decrease the value of the "Line Active" and / or the "Pixel Depth" parameters.

Error #	Problem:	Possible Cure(s):
2520	Horizontal picture memory allocation is too large.	Due to certain system constraints, the combination of values for the "Line Active" and / or the "Pixel Depth" parameters is too large. Decrease the value of the "Line Active" and / or the "Pixel Depth" parameters.
2550	Not enough memory for vertical picture memory allocation.	There is not enough video memory available in the mainframe to support the given Image size (in pixels) at the given pixel depth. Decrease the value of the "Line Active" and / or the "Frame Active" and / or the "Pixel Depth" parameters.
2631	Digital sync channel does not support that type.	The plug-in you are using does not allow the specified sync channel to be used for the specified type of sync signal. Change sync channel type selection under "D-Sync"in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on sync types that are supported.
2684	Digital sync bank type requires special hardware.	The operating system software is configured to show that the mainframe does not have the correct sync hardware installed. If the mainframe does have the hardware installed, you will have to reinstall the software.
2700	Analog video bank type not allowed.	The plug-in you are using does not support the type of analog video specified. Change analog video type selection under "A-Signal"in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported analog video types.

Error #	Problem:	Possible Cure(s):
2701	Analog video channel does not exist. (re.type)	The plug-in you are using does not support the type of analog video specified for the green analog video channel. Change the analog video type selection for an individual channel under "A-Video"in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported analog video types.
2703	Analog video channel types must be specified by bank.	The plug-in you are using does not support selecting the type of analog video being output on a given channel. Change the analog video type selection, as a group, under "A-Signal"in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported analog video types.
2713	Analog video channels must be gated by bank.	The plug-in you are using does not allow independent gating of the analog video channels. Change channel gating selection(s) under "A-Signal" in the "Options" menu or use a different plug-in.
2714	Analog video channel gating not allowed.	The plug-in you are using does not allow gating of the analog video channels. Change channel gating selection(s) under "A-Signal" in the "Options" menu or use a different plug-in.
2720	Digital video bank type not allowed.	The plug-in you are using does not support the type of digital video selected. Change digital video type selection under "D-Signal" in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported digital video types.

Error #	Problem:	Possible Cure(s):
2722	Digital video channel does not support that type.	The plug-in you are using does not support the type of digital video that is selected for a specific channel. Change digital video type selection for a given channel under "D-Video" in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported digital video types.
2723	Digital video channel types must be specified by bank.	The plug-in you are using does not allow selecting the type of video on a digital video channel on an individual basis. Change digital video type selection under "D-Signal" in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported digital video types.
2733	Digital video channels must be gated by bank.	The plug-in you are using does not allow independent gating of the digital video channels. Select digital video gating under "D-Signal" in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported types of digital video gating.
2740	Digital video bank true value not allowed.	The plug-in you are using does not support the logic level selected for all digital video channels. Change logic level selection under "D-Signal" in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported logic levels.
2742	Digital video channel does not support that true value.	The plug-in you are using does not support the logic level that is selected for a specific channel. Change the logic level selection for a given channel under "D-Video" in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported logic levels.

Error #	Problem:	Possible Cure(s):
2743	Digital video channel true values must be specified by bank.	The plug-in you are using does not allow independent selection of a digital video channel's logic level. Change the logic level selection for all digital video channels under "D-Signal" in the "Options" menu or use a different plug-in. The documentation supplied with each plug-in contains information on the supported logic levels.

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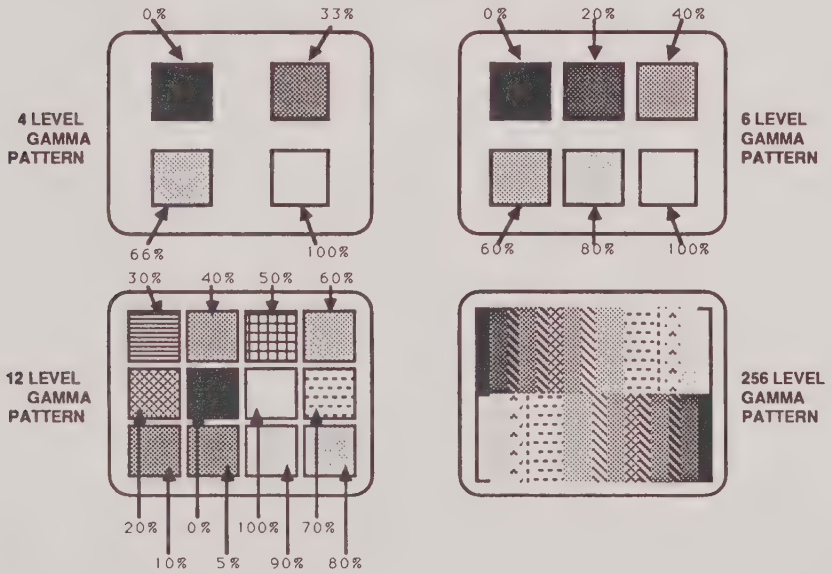
4level, 6level, 12level and 256level

Front Panel Path: **Images** / COLOR / 4level
Images / COLOR / 6level
Images / COLOR / 12level
Images / COLOR / 256level

Description: Multiple gray boxes are drawn on a black background. The intensity levels of the boxes are dependent upon the image selected. The 256 level image consists of two rows of narrow vertical bars. The width of each bar, in pixels, is the same. If the horizontal resolution of your format is not an even multiple of 256 pixels, the remaining pixels are grouped along the right side of the image. The top row of bars start at black level and increase to 100% white level in 255 equal steps. Any remaining pixels in the top row start with one (1) row of black pixels with the rest at 100% white level. The bottom row of bars start at 100% white level and decrease to black level in 255 equal steps. Any remaining pixels in the bottom row start with one (1) row of 100% white level pixels with the rest at black level.



Attributes: No Editable attributes.

Test: **Video Level Tracking (Color Monitors)**

Purpose: In order for your color monitor to accurately produce the correct colors at all intensities, all three (3) video channels should have the same gain characteristics.

Method: Perform the "Brightness Control Adjustment" and "Brightness Uniformity" tests first.

Select the image with the correct number of levels. Center your color meter probe within each square. The brightness and color temperature for each square should be within your monitor's spec limits.

Test: **Video Gain Linearity (Monochrome Monitors)**

Purpose: In order for your monitor to accurately produce the correct contrast range of a displayed image, the video channel must have linear gain characteristics.

Method: Perform the "Brightness Control Adjustment" and "Brightness Uniformity" tests first.

Select the image with the correct number of levels. Center the photometer probe within each square. The measured brightness for each square should be within your monitor's spec limits.

256color

Front Panel Path: **Images** / COLOR / More / 256color

Description: 256 equal size boxes are drawn using 256 different colors and shades of gray for each box. The image consists of 16 rows of boxes with 16 boxes per row. The bottom row has stepped gray levels. Eight (8) equally stepped levels of red, six (6) equally stepped levels of green and five (5) equally stepped levels of blue, in every possible combination, are used to draw the remaining boxes.

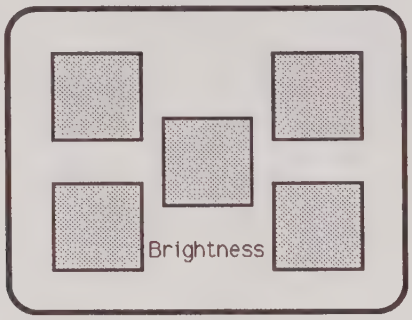
Attributes: No Editable attributes.

Test: **Pre-Release Evaluation Image**

bright

Front Panel Path: **Images** / SETUP / bright

Description: Five (5) white squares (100% video level) are placed on a black background. A square is placed in each corner of the display and in the center of the display.



Attributes: No Editable attributes.

Test: **Brightness Control Adjustment**

Purpose: The wrong brightness setting on your monitor may cause other tests (for example; Contrast, Focus and Beam size) to be invalid. An accurate brightness setting will help to give you repeatable measurements throughout other tests.

Method: Center your light meter probe within the center square and adjust your monitor's brightness control to obtain the required light meter reading.

Test: **Brightness Uniformity**

Purpose: The light output of most picture tubes varies slightly when measured across the CRT face. This test can be used to verify that the light output variation is within your spec limits.

Method: Perform the "Brightness Control Adjustment" test first. Then center the light meter probe in each of the corner squares while noting the reading you get for each square. Compare the readings with your spec limits. Next measure the center square. The deviation between each of the corner readings and the center reading should also be within your spec limits.

checker

Front Panel Path: **Images** / FINAL / More / checker

Description: The screen is filled with alternating black and white pixels. This forms a checkerboard with each square being a single pixel.

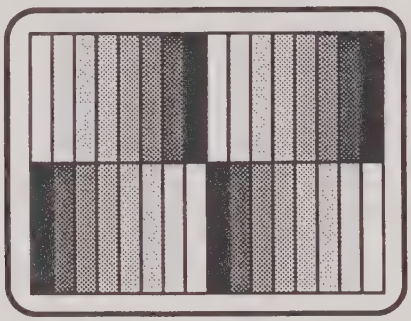
Attributes: No Editable attributes.

Test: **Pre-Release Evaluation Image**

colorBar (Color Bars)

Front Panel Path: **Images** / COLOR / colorBar

Description: Two (2) rows of color bars fill the screen, with up to sixteen (16) bars per row. The top and bottom are identical except that the sequence is in reverse order. The exact sequence of colors is dependent upon the type of monitor you're testing and how it is connected.



Attributes: No Editable attributes.

Test: **Verify that all video channels are functional.**

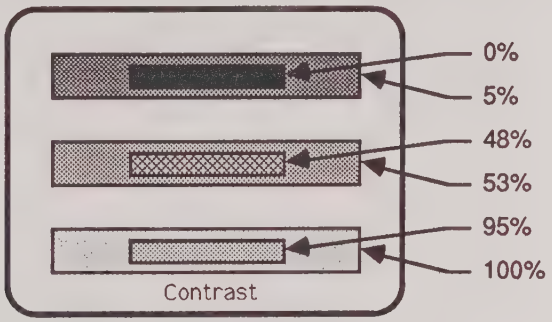
Purpose: To verify that none of the video channels are bad or hooked up wrong.

Method: Compare the sequence of color bars to that of a known good monitor. Missing bars may indicate a dead or unconnected channel. The transition between the bars should be sharp and distinct. Each bar should also be uniform in color and intensity across its entire width. Non-uniformity may indicate problems with the response of the video amplifiers. If all of the bars are present but in the wrong order, then the inputs may be improperly connected.

contrast

Front Panel Path: **Images** / COLOR / More / contrast

Description: Three (3) large horizontal bars are drawn on the the screen. A smaller bar is drawn inside each of the larger bars. The intensity levels of the individual bars are labeled in the upper left hand corner of each bar.



Attributes: No Editable attributes.

Test: **Verify Contrast Range**

Purpose: A monitor should show a linear response to all video intensity levels and not show signs of clipping at either extreme of intensity.

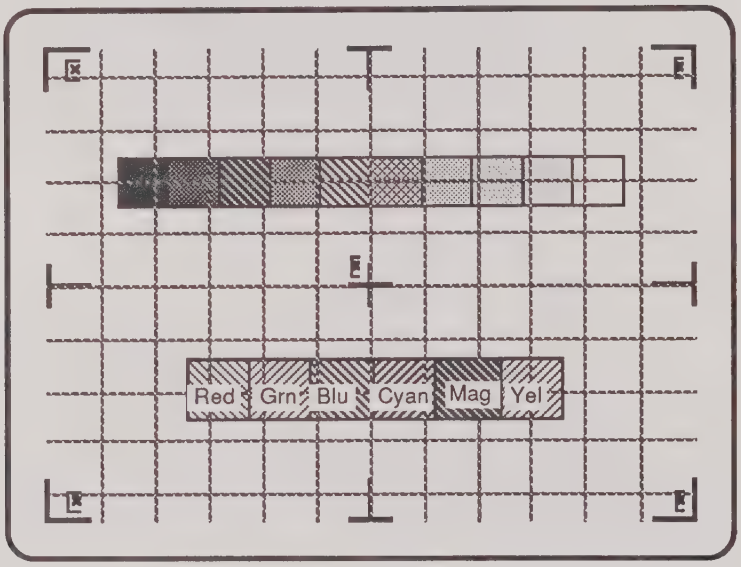
Method: Perform the "Brightness Control Adjustment" test prior to doing this test. The smaller bars should be visible in all of the larger bars. Failure to discern the smaller bars indicates either a misadjustment of the brightness and contrast controls or a defective video circuit.

controls

Front Panel Path: **Images** / SETUP / controls

Description: The screen has a black background and contains the following:

1) A white crosshatch image; 2) white "Cx" characters located in each corner and at the center; 3) a horizontal bar containing a six step color sequence (The bars are not labeled in the actual display); 5) a horizontal bar containing a 10 level gray scale sequence; 6) white video limit markers centered top and bottom and at both sides; and 7) a white crosshair at video center.



NOTE: Color Bars are not labeled

Attributes: No Editable attributes.

Test: **Verify Controls are Functional**

Purpose: It's a good idea to verify early in testing whether your monitor's pots, coils, etc. can be adjusted. If you find a control that is defective, you can reject the monitor for repair before you've wasted adjustment time.

Method: While viewing the test image, turn each pot, coil and trimmer that you will use to adjust your monitor. Verify for each control that there is a change in the picture. For example, turn the focus control and look at the "Cx" in the corners and at the center to see whether they can be adjusted in and out of focus.

Test: **Preliminary Control Setup**

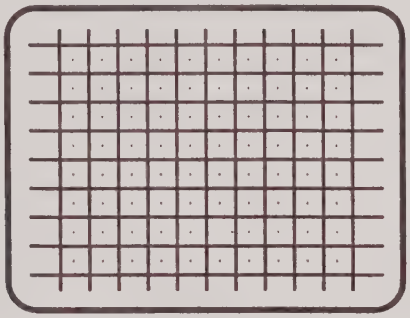
Purpose: A single image is often useful to get all of your controls in a "ballpark" range prior to making precision adjustments.

Method: Adjust each control to its proper range while viewing the image. Set any controls to midrange if you can't make a quick adjustment by eye.

converge (Color Convergence)

Front Panel Path: **Images** / GEOMETRY / converge

Description: A white crosshatch image is drawn on a black background. A single pixel dot is located in the center of each crosshatch box.



Attributes: Color of lines and dots can be changed to any combination of primaries.

Test: **Convergence Adjustment**

Purpose: In order to accurately produce an image on a color monitor, the three electron beams in the CRT must meet (converge) at the exact same location at the same time. Lines displayed on a misconverged monitor will appear as several multicolored lines and the transitions between different colored areas will contain "fringes" of other colors.

Method: The convergence adjustments of most color monitors can be broken down into two main categories.

The first set of adjustments, usually called "Static Convergence", calls for aligning the three beams in the center of the display. The idea is to turn on all three guns and adjust the various magnets on the convergence assembly to produce all white lines and dots in the center of the display. The convergence assembly is located on the neck of the CRT. Different monitors and CRT types may each require their own magnet adjustment sequence.

After the center of the display is properly converged, the outer areas can be adjusted by using the monitor's "Dynamic Convergence" controls. The number of controls, the area of the screen that they affect and their adjustment procedure is dependent upon the monitor you're testing.

dotGrid

Front Panel Path: **Images** / GEOMETRY / dotGrid

Description: The screen is filled with wide spaced single pixel dots.

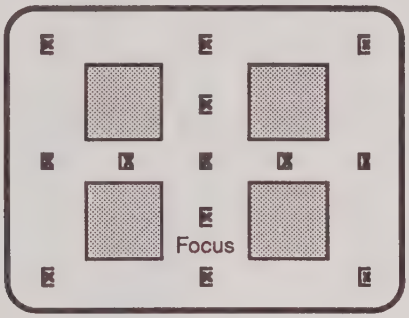
Attributes: No Editable attributes.

Test: **Pre-Release Evaluation Image**

focus

Front Panel Path: **Images** / FINAL / focus

Description: Thirteen (13) white "Cx" Characters are drawn on a black background. The characters in the corners and at the edges are placed at the limits of displayed video. Four (4) white squares are also drawn in each quadrant.



Attributes: The "Cx" and background can be reversed to produce black characters on a white background. The white squares are outlined in black in this case.

Test: **Focus Adjustment(s)**

Purpose: An out of focus monitor will display fuzzy graphics images, and poorly formed, hard to read, characters when text is put up on the screen.

Method: Center your light meter probe within the each of the squares and adjust the monitor's brightness control to obtain a specified average reading on the light meter.

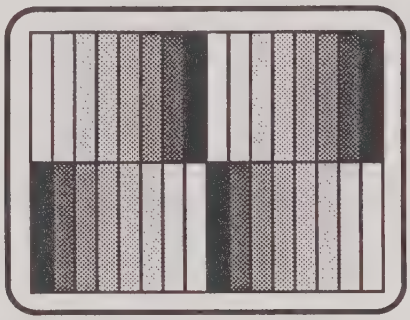
On monitors with a single (Static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits.

Some monitors have a static and one or more dynamic focus controls. The sequence for adjusting them and the areas of the screen that they affect are dependent upon the monitor you're testing.

grayBar (Multilevel Gray Bars)

Front Panel Path: **Images** / COLOR / grayBar

Description: Two (2) rows of bars fill the screen, with up to sixteen (16) bars per row. The top and bottom are identical except that the sequence is in reverse order. A gray scale sequence is formed for analog monochrome monitors.



Attributes: No Editable attributes.

Test: **Verify that the analog video channel is functional.**

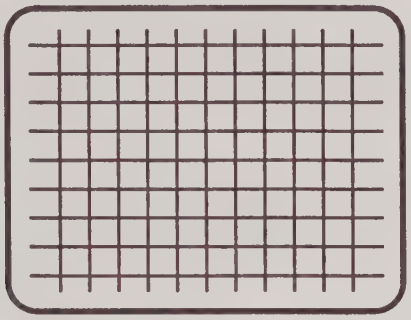
Purpose: To verify that the video channel is bad or hooked up wrong.

Method: Compare the sequence of bars to that of a known good monitor. Non-uniformity may indicate problems with the response of the video amplifier.

hatch-#- (Crosshatch)

Front Panel Path: **Images** / SETUP / hatch-#-

Description: A white crosshatch image is drawn on a black background.



Attributes: No Editable attributes. Use the "hatch--#" image for a changeable crosshatch.

Test: **Convergence Check (Color Monitors Only)**

Purpose: This image can be used to make your initial coarse convergence adjustments.

Method: Use the center portion of the image to make your coarse static adjustments. Use the entire image to make your coarse dynamic adjustments. Use the "Converge" image if you wish to control the individual guns.

Test: **Linearity Check**

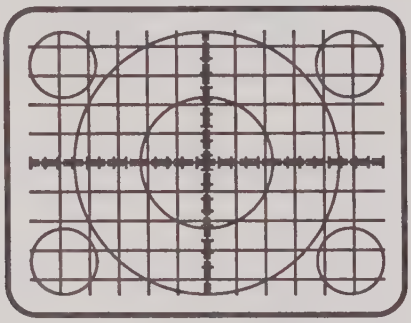
Purpose: Verify that the monitor's horizontal and vertical linearity are correct.

Method: All of the full boxes in the crosshatch should be the same size. Any difference in the sizes may indicate that your monitor's linearity adjustments are not correct and that the "Linearity Adjustment" test will have to be done.

linear (Linearity)

Front Panel Path: **Images** / GEOMETRY / linear

Description: This image consists of three parts. The first part consists of six (6) white circles. A large circle is drawn in the center of the screen. The diameter is set to be equal to the lesser of the video height or width of the display. A smaller circle is drawn at half the diameter and concentric with the larger circle. A circle is also drawn in each of the corners of the screen. The diameter of the corner circles is equal to one-fifth of the display width. The second part of the image consists of a white crosshatch image. The number of boxes in the crosshatch is dependent upon the physical size of the display. The last part of the image consists of white "tic" marks drawn along the horizontal and vertical center lines of the image. The marks are one pixel thick and drawn at every other pixel location. Every fifth mark is drawn slightly longer.



Attributes: No Editable attributes.

Test: **Linearity Adjustment**

Purpose: In order to present an undistorted display, the horizontal and vertical sweeps of the electron beam across the face of the CRT should be at uniform speeds. Any non-uniformity in the sweep will cause portions of an image to be stretched while other portions will be compressed. Non-linearity in a monitor can show up in several ways. It may be present across the entire screen, a large portion of the screen or it may be localized in a very small area.

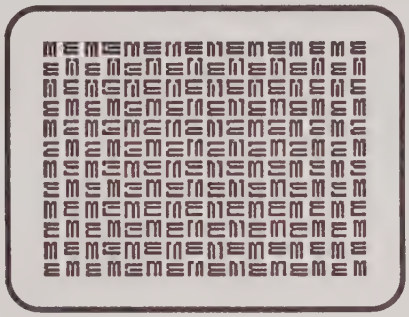
Method: In order to properly use this image the actual display size must match the display size parameters entered in the Format.

You can use the circles in the image to do a "ball park" adjustment of a monitor's linearity controls. Adjust the controls to form perfectly round circles. The crosshatch image can be used to measure linearity and to make finer control adjustments. All of the full boxes in the crosshatch should be identical in size. You can measure the boxes with a ruler or with a gauge made for the monitor you're testing. Any deviation should be within your spec limits. Linearity over a small portion of the display can be measured with the aid of the "tic" marks and a ruler or gauge. Compare the number of tic marks per unit of measure with an adjacent or overlapping area.

meme

Front Panel Path: **Images** / FINAL / meme

Description: The screen is filled with white lower case "m's" on a black background. Every other character is rotated counter-clockwise by 90 degrees.



16 x 16 pixel
Bit Map of
Repeating Pattern

Attributes: You may switch between white characters on a black background or black characters on a white background.

Test: Monitor Resolution

Purpose: If your monitor is used in an application that calls for large amounts of text or fine lines to be displayed, you can use this image to check the resolution.

Method: Select the correct type of presentation from the edit menu. Adjust your monitor's brightness, contrast and focus controls to obtain the best image. The characters in all areas of the display should be well formed and in focus.

pageChar

Front Panel Path: **Images** / FINAL / More / pageChar

Description: The screen is filled with a repeating single character.

Attributes: The font, ASCII character code, horizontal spacing,vertical spacing, left edge offset and top edge offset can all be edited in real time. You may also switch between white characters on a black background or black characters on a white background.

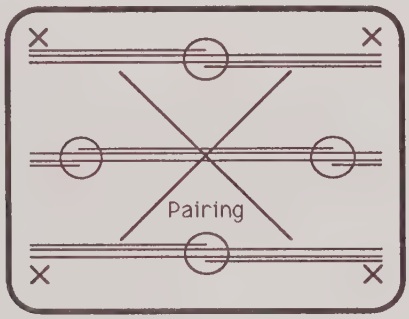
Test: **Pre-Release Evaluation Image**

pairing (Interlaced Formats Only)

Front Panel Path: **Images** / FINAL / pairing

Description: Three groups of white lines are drawn across a black background. The upper group consists of four (4) distinct lines that are one (1) scan line thick. Two (2) of the lines extend completely across screen. They are located on adjacent frame lines in alternate fields. A third line is drawn adjacent and above the first two. It extends from the left edge to the center of the screen. The fourth line is drawn adjacent and below the first two and extends from the center to the right edge. The bottom group of lines is identical to the top group. The middle group consists of five lines. The first two are adjacent and extend completely across the screen. Two short lines are drawn adjacent and below the first two. They are located towards both sides of the the screen. The fifth line is drawn adjacent and above the first two lines. The endpoints of this line correspond with the endpoints of the two shorter lines. Small white circles indicate the transition points.

In addition, five (5) X's (Crossed lines) are drawn. A small X is located at each corner and a large X is drawn in the middle. The lines are drawn having a 1 pixel by 1 pixel slope.



Attributes: No Editable attributes.

Test: **Interlace Pairing**

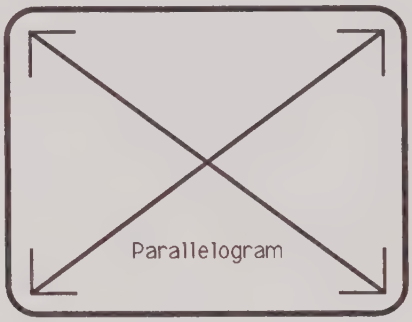
Purpose: In order to optimize a displayed image on an interlaced monitor, the lines of one field should end up equally spaced between the lines of the alternate field. A small error may not be noticeable or objectionable to an observer. Worse errors will cause the appearance of light and dark stripes over a displayed area. In a worst case condition, the lines in each field will completely overlap (pair) causing the displayed vertical resolution to be cut in half.

Method: Three (3) equally spaced lit up raster lines should show up in all the displayed groups. The lines in all groups should be equally spaced. That is, the distance from the odd to the even field and the even to the odd field should be the same. You can make a rough visual measurement just by looking closely at the screen. A monitor with Pairing error will cause one or more of the groups of lines to appear to have two (2) rather than three (3) lines. You may need a magnifier or low power microscope to measure the actual deviation and then compare it to your spec tolerances to be precise.

parallel (Parallelogram)

Front Panel Path: **Images** / GEOMETRY / parallel

Description: Four (4) white corner markers are drawn on a black background. The opposite corners are joined by two (2) white diagonal lines.



Attributes: No Editable attributes.

Test: **Parallelogram Distortion Check**

Purpose: Parallelogram distortion is very difficult to correct with magnets because the correction often causes barrel distortion. Therefore, you should decide early whether your monitor meets this spec. The problem can usually be traced to the improper winding of the yoke coils. If the problem is not too severe, it may be corrected by adding or adjusting magnets on the yoke. If the distortion is excessive, it may be an indication of a defective yoke which no amount of magneting could correct.

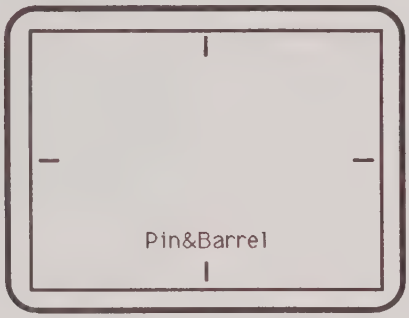
Method: Measure the lengths of the two (2) diagonal lines. Any difference is an indication of parallelogram distortion. The difference in readings should be within the specifications of the monitor.

If the difference in the readings is too far beyond spec, the monitor should be rejected and sent back for repair before the operator wastes time trying to magnet a defective yoke.

pin&brl (Pincushion and Barrel Distortion)

Front Panel Path: **Images** / GEOMETRY / pin&brl

Description: A white border, one pixel wide, is drawn on a black background. White "tic" marks indicate the midpoints of each side and the top and bottom.



Attributes: No Editable attributes.

Test: **Pin and Barrel Correction**

Purpose: If you were to send perfectly linear sweep signals to a perfectly wound deflection yoke that was mounted on a perfect CRT, you would not necessarily get a perfectly formed raster. You would most likely get a raster that had its corners stretched away from the center so that it resembled a pincushion. This distortion occurs because the geometry of the deflected electron beam does not match the geometry of the faceplate of the tube. In addition, any imperfection in the yoke or CRT may add to or modify this problem. In some cases one or more corners may be pulled in towards the center of the raster causing it look like a barrel. Any uncorrected raster distortion will carry over as distortion of the displayed image.

Method: A way of determining if the amount of pincushion and/or barrel distortion is within limits is with a device known as a "slot gauge". A basic slot gauge may consist of a piece of opaque film with at least two (2) transparent slots in it. One slot is used for top and bottom distortion and the other is used for the sides. By positioning the correct slot over each portion of the border line, the entire line should be visible. If this can not be done at all four sides, then the monitor needs correcting.

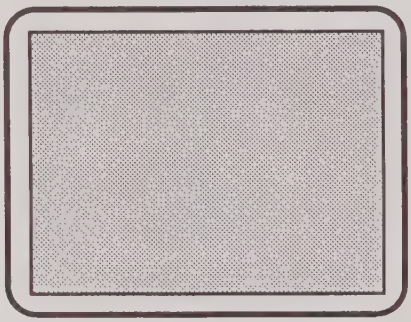
There are two (2) main methods of correcting pincushion distortion. The first involves placing or adjusting magnets on the yoke. This is pretty much a trial-and-error method. After a while, a skilled operator will develop a feel for how strong a magnet to use and how to place it in order to obtain the desired correction. If any correction is performed the "Trapezoid Distortion Correction" test should be repeated.

The other method of correction involves adding correction signals to the deflection signal driving the yoke. This method is usually found in color monitors, where adding magnets to the yoke would cause problems with convergence and purity. The type and number of of adjustments is dependent upon the monitor being tested.

purity (Color Only)

Front Panel Path: **Images** / SETUP / purity

Description: A solid white background fills the active video area. There is no label on this image.



Attributes: Color of the background can be changed to any combination of primaries.

Test: **Purity Adjustment**

Purpose: In order to produce the correct colors in a displayed image, the electron beams from each of the three (3) guns in the CRT should only strike their matching phosphors. A white image will show patches of various colors on a monitor with bad purity. The purity adjustment(s) should be performed before doing any brightness or color tests. In some cases, purity adjustments involve loosening and repositioning the yoke, in which case purity should be adjusted prior to doing any geometry tests.

Method: The methods used for adjusting purity on a color monitor depend on the type of monitor you're testing and the type of CRT you're using (for example; Delta, In-Line or Single Gun). In most cases, the first step is the same: de-gauss the CRT.

For a Delta Gun CRT turn on only the Red Gun. A solid uniform field of red should be displayed. If the color is not uniform, adjust the yoke and the "Purity Tabs" assembly.

For an In-Line Gun CRT turn on only the Green gun. A solid uniform field of green should be displayed.

Follow the CRT manufacturer's recommended set-up procedure to get the best results.

If purity can not be corrected to acceptable limits, the monitor may not have been properly de-gaussed or there may be a defect in the CRT or purity assembly.

Test: **Shadow Mask Warping**

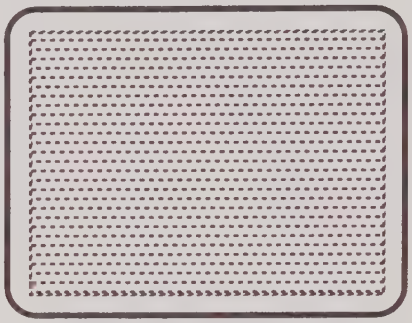
Purpose: The purity characteristics of your CRT can change over time if you leave it on with a lot of video being displayed. This may be because the CRT's electron beams are striking its shadow mask with enough energy to cause the mask to heat. This internal heating may be enough to cause the shadow mask to warp and give you bad purity.

Method: Set the purity image to white and allow your monitor to run for a few minutes. Any mask warping will start to show up as a change in purity. You can use a color meter to measure the change. The "Color Temp" pattern may also be useful for measuring shadow mask warping.

raster (Blank Raster)

Front Panel Path: **Images** / SETUP / raster

Description: A totally black display.



Attributes: No Editable attributes.

Test: **Raster Centering**

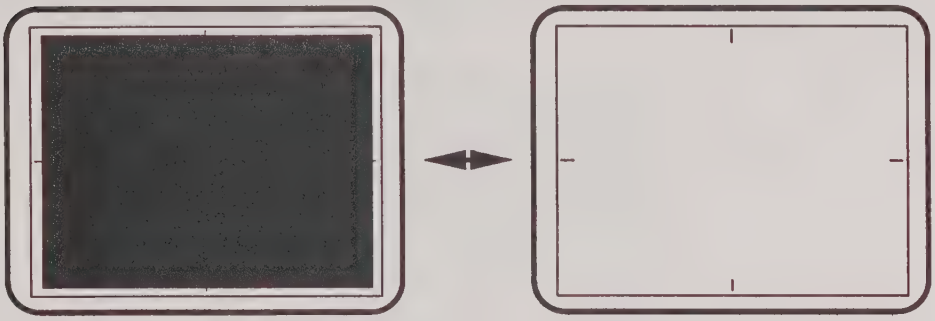
Purpose: Many monitor applications require that the displayed image or text fit completely within a bezel that surrounds the CRT. This requires that you first center the raster on the face of the CRT, then center the image within the raster. Use this image for centering the raster on the CRT.

Method: Turn up your monitor's brightness control until the raster is visible. Adjust the raster's position and size using the size and raster centering controls. The raster centering adjustment for many monochrome monitors consists of moving magnetic rings on the deflection yoke.

regulate (High Voltage Regulation)

Front Panel Path: **Images** / FINAL / regulate

Description: The image cycles between two (2) images. The first image is a white outline with "tic" marks near the center of each edge that defines the edges of displayed video. The other image consists of the same outline plus a solid white rectangle centered within the outline. The size of the solid rectangle is equal to 95% of the height and width of displayed video.



Attributes: No Editable attributes.

Test: **High Voltage Regulation**

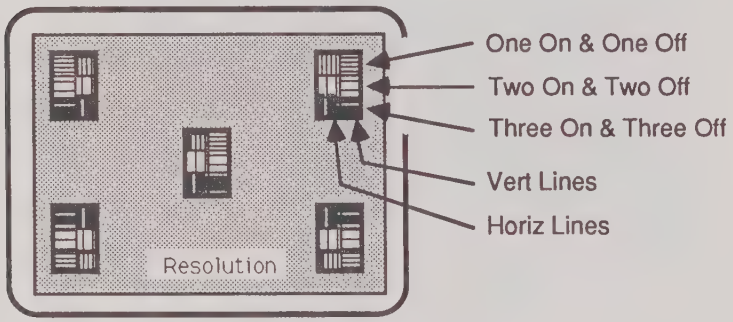
Purpose: The size of a displayed image should not change as you vary the amount of displayed video. You can measure the size change to determine the high voltage regulation performance.

Method: The size of the border for each image should not change. The difference in border size between the the two images should be within the spec limits for the monitor you're testing.

resolve

Front Panel Path: **Images** / FINAL / resolve

Description: The screen is filled with a checkerboard image of alternating black and white pixels. Rectangular patches are placed in each corner and at the center of the display. The patches are made up of six (6) smaller boxes that are made up of lines that are one, two or three pixels wide and have the lines drawn either horizontally or vertically. The details of one of the rectangles is shown below. The center rectangle is oriented the same as the top-right rectangle. The other corner rectangles are flipped so that the highest resolution box is in the outside corner.



Attributes: No Editable attributes

Test: Verify Monitor Resolution

Purpose: The resolution of your monitor should meet or exceed the design specs.

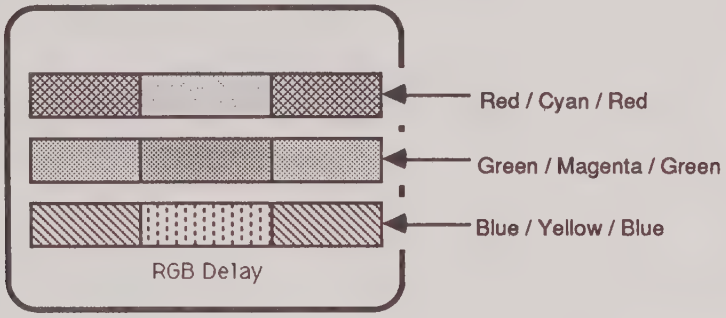
Method: Adjust the brightness, contrast, and focus to their correct settings. You should see individual and distinct lines in all areas of the display. Failure to see distinct lines in the highest resolution portion of the image may indicate you have a defective video amplifier or picture tube.

If multicolored vertical lines appear on a mask type color picture tube, you may have a problem with convergence or may be exceeding the horizontal resolution of the tube.

rgbDelay

Front Panel Path: **Images** / FINAL / rgbDelay

Description: Three (3) horizontal bars spaced vertically across the screen on a black background. Each bar is divided into three (3) equal size segments. The color sequence for each bar is shown below.



Attributes: No Editable attributes.

Test: **Verify Video Channel Rise and Fall Times**

Purpose: In a color monitor it is important that all three video channels respond to the same signal in the same way. If the rise and fall times of the three channels are not the same, then the transitions between different colors of a displayed image will not be sharp and may contain "false" colors.

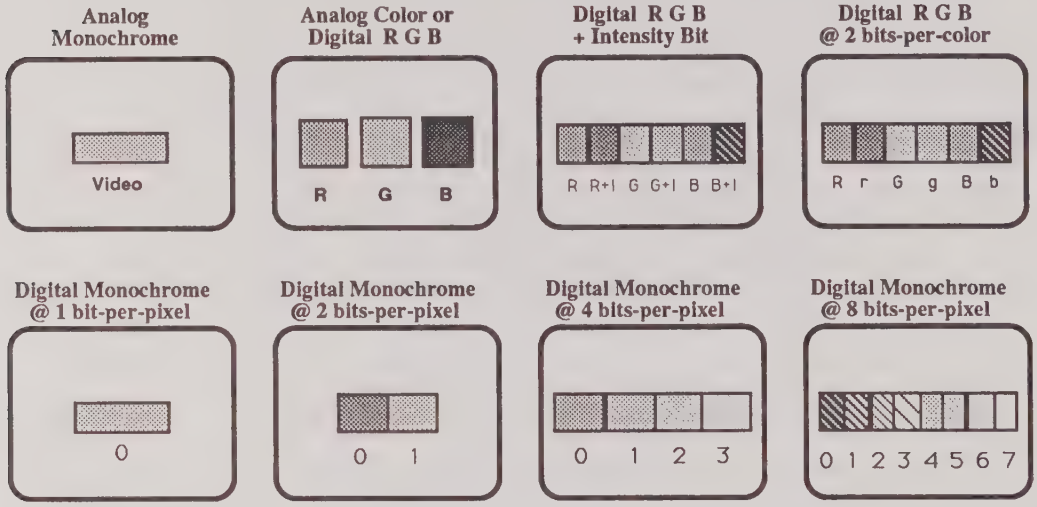
Method: Observe the boundaries between each of the segments of each bar to see if the transition is well defined and does not have any coloration other than the two colors you're viewing. For example, the red to cyan transition of the first bar should not be fuzzy and should not contain any other colors except red and cyan.

Under certain conditions, a gun delay problem may show the symptoms of horizontal mis-convergence. This problem may be isolated by using a multi-channel oscilloscope to check the response of the amplifiers.

signals

Front Panel Path: **Images** / SETUP / signals

Description: Labeled boxes are drawn on a black background. The number of boxes is dependent upon the "Options" settings in the current Format. Each box indicates that the video signal line is connected.


Analog Monochrome
Video
Analog Color or Digital R G B
R G B
Digital R G B + Intensity Bit
R R+I G G+I B B+I
Digital R G B @ 2 bits-per-color
R r G g B b
Digital Monochrome @ 1 bit-per-pixel
0
Digital Monochrome @ 2 bits-per-pixel
0 1
Digital Monochrome @ 4 bits-per-pixel
0 1 2 3
Digital Monochrome @ 8 bits-per-pixel
0 1 2 3 4 5 6 7

Attributes: No Editable attributes.

Test: Signal Verification

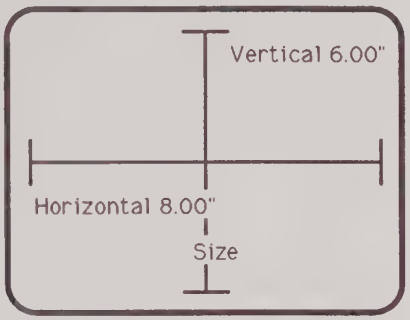
Purpose: It's a good idea to verify early in testing that the cables on your monitor are connected properly.

Method: All of the boxes should be present and be the correct color and intensity. If any of them are wrong, then your monitor may be improperly connected, badly mis-adjusted, or defective.

size

Front Panel Path: **Images** / GEOMETRY / size

Description: Two (2) full length white lines are drawn vertically and horizontally on a black background. The lines cross in the center of the screen and have "tic" marks at their endpoints. These marks indicate the edges of displayed video. The displayed image height and width information, stored in the "Format", are displayed.



Attributes: No Editable attributes.

Test: Display Size Adjustment

Purpose: This image shows you where to measure the display size and gives you the correct size setting. The size values are part of the Format information you entered. A correct size setting is needed to get round circles and square light meter patches.

Method: Place a ruler or gauge along the horizontal line of the image and adjust your monitor's horizontal size control until the distance between the endpoints matches the displayed value.

Move the ruler or gauge to the vertical line and adjust your monitor's vertical size control until the distance between the endpoints matches the displayed value.

smpte (SMPTE Image RP-133)

Front Panel Path: **Images** / GENERAL / smpte

Description: This image is based on the proposed recommended practice (RP-133) of the Society of Motion Picture and Television Engineers (SMPTE). The image is self scaling as to the number of active pixels and active lines being used. The dimensions adjust to the nearest whole pixel. The amount of detail and intensity levels in the image are determined by the number of bits per pixel (Pixel Depth) that is set by the Format. This information follows the descriptions of the individual components of the image.

1) The image is drawn on a reference **Background**.

2) **Cross Hatch:** There are 10 boxes vertically. The number of horizontal boxes is based on the physical aspect ratio contained in the "Format" principal. The boxes end up perfectly square with any fractional spaces placed around the outside edges of the image. The vertical lines are two (2) pixels thick while the horizontal lines are two (2) scan lines thick. Small crosses indicate the intersection of the horizontal and vertical lines when they are covered over by other parts of the main image.

3) **Resolution Patch:** The patch is made up of twelve (12) smaller boxes that are each 6.25% of the height of the display. The boxes are made up of alternating intensity stripes. Some of the stripes run vertically and some run horizontally. The stripes may be one, two or three pixels wide each. The details of the patch are shown in the illustration. The patches are located in each corner of the main image and in the center. They are oriented such that the highest resolution boxes are closest to the outside corners.

4) **Gray Scale Boxes:** Twelve (12) boxes are clustered around the center of the main image at eleven (11) intensity levels. They start at 0% and increase in 10% steps up to 100% with two (2) boxes at a 50% level. The individual levels are labeled in each box.

5) **Contrast Boxes:** Two (2) boxes are drawn adjacent to the Gray Scale Boxes. They are at 0 and 100% levels. There are smaller boxes drawn inside of each box at 5 and 95% levels. They are pointed out in the illustration.

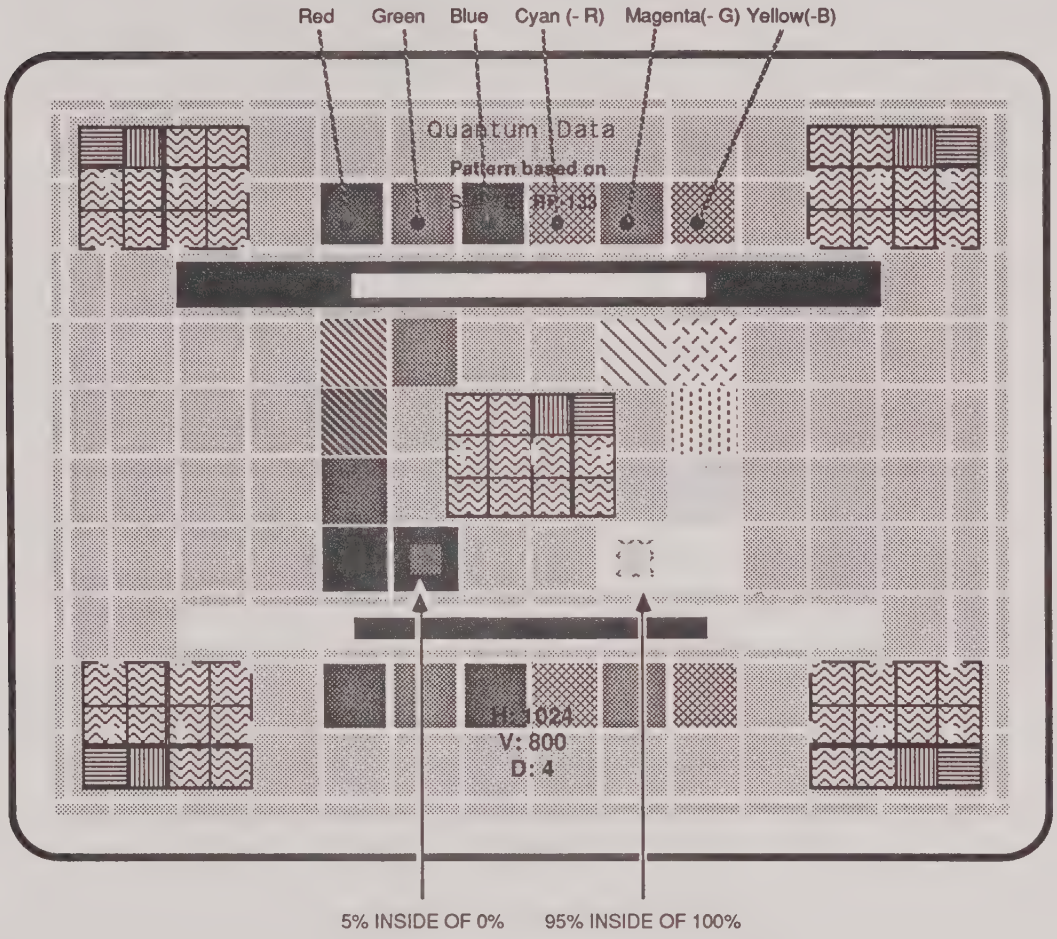
6) **Black & White Windows:** Two (2) horizontal bars are located above and below the Gray Scale Boxes. They have a height equal to 8% of the display height. There are half-size bars centered within the larger bars.

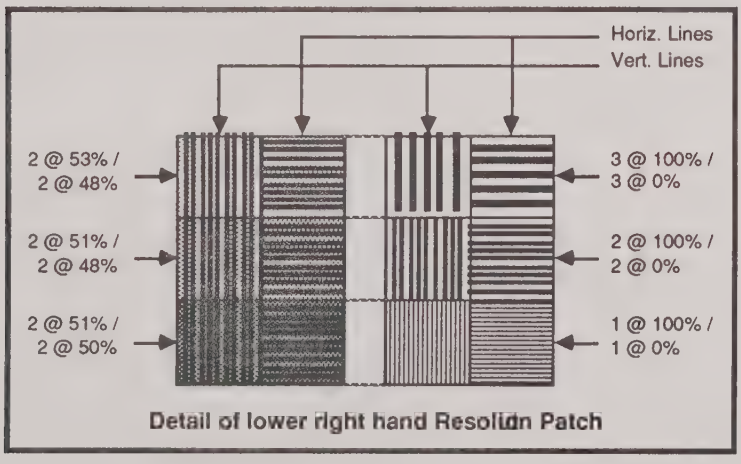
7) **Border:** A border line is drawn around the image. The border is set in from the edges of displayed video by a distance equal to 1% of the displayed height and has a thickness equal to 0.5% of the displayed height. The intensity level is the same as that of the cross hatch lines.

8) **Color Bars:** (Color Formats Only) Two (2) groups of color bars are placed above and below the main image. Color Bars are not part of the original SMPTE specification.

9) **Text:** Image identification data is located in the upper portion of the image. The lower portion contains information on the number of horizontal and vertical pixels as well as the number of bits per pixel in the current "Format".

Image: RP-133


Red
Green
Blue
Cyan (- R)
Magenta(- G)
Yellow(-B)
Quantum Data
Pattern based on
RP-133
H: 1024
V: 800
D: 4
5% INSIDE OF 0%
95% INSIDE OF 100%


Horiz. Lines
Vert. Lines
2 @ 53% /
2 @ 48%
2 @ 51% /
2 @ 48%
2 @ 51% /
2 @ 50%
3 @ 100% /
3 @ 0%
2 @ 100% /
2 @ 0%
1 @ 100% /
1 @ 0%
Detail of lower right hand Resolution Patch

Availability / Intensity Level Chart

Bits per pixel:	@8 Bits	@4 Bits	@2 Bits	@1 Bit
Background	50%	50%	51%	0%
Resolution Patch	Full	Full	48 & 51% and	0 &100%
Cross Hatch & Border	75%	80%	0%	100%
Gray Scale Boxes	Yes	Yes	Not Available	Not Available
Contrast Boxes	Yes	Yes	Not Available	Not Available
Windows	5 & 95%	5 & 95%	0 &100%	Not Available
Color Bars	Yes	Not Available	Not Available	Not Available
Text	75%	80%	0%	100%

Attributes: No Editable attributes.

Test: **Monitor Resolution**

Purpose: Verify that the horizontal and vertical resolution of the monitor meets your specs.

Method: Run the image with a Format that represents the highest resolution you require. The 0 and 100% intensity portion of the resolution patches will always be present, regardless of the number of bits per pixel.

Test: **Display Linearity Check**

Purpose: Verify that the horizontal and vertical linearity meets your specs.

Method: All of the full boxes in the cross hatch portion of the image should be the same size.

Test: **Video Tracking**

Purpose: Verify that the response of your monitor's video circuits is/are linear.

Method: The intensity levels of the individual boxes of the gray scale portion of the image may be checked with a spot photometer to see if they are within limits.

Test: **Brightness and Contrast Adjustment Check**

Purpose: Verify that your monitor's brightness and contrast controls are in range.

Method: The small boxes should be easily discernible within the larger boxes in the contrast boxes portion of the image.

Test: **Video Amplifier Response**

Purpose: Your monitor's video amplifier circuits should show no signs of mid-band streaking (poor low-frequency response), ringing, or overshoot.

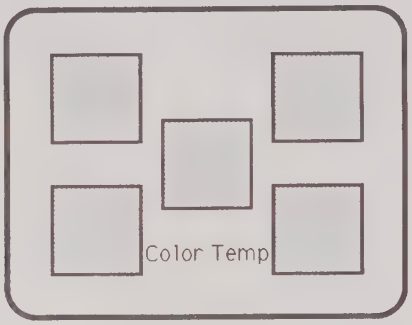
Method: The two (2) black and white window portions of the image should have uniform intensities from left to right. Shadows or "ghosts" indicate problems.

Test:	**Small Signal Response**
Purpose:	A monitor should be capable of displaying small changes in video signal levels.
Method:	Portions of the Resolution Patch contain alternating stripes that have very small changes in signal level, centered around a 50% intensity level. The stripes are two (2) pixels thick and represent 1%, 3% and 5% changes in contrast. You should be able to see these alternating intensity level stripes. Keep in mind that the smallest contrast change you can see will depend on your monitor's gray scale specs.
Test:	**Focus Check**
Purpose	Your monitor should have good focus characteristics in all areas of the display.
Method:	The text and resolution portions of the image may be used for checking focus.
Test:	**Color Operation Checks**
Purpose:	The individual channels of your color monitor should function properly.
Method:	Run the image with a Format that has 8 bits per pixel. Color bars should appear above and below the image in the correct order per your monitor's specs. The gray scale boxes may be used for checking tracking.

temp (Color Temperature)

Front Panel Path: **Images** / COLOR / temp

Description: Five (5) white squares are placed on a black background. A square is placed in each corner of the display and in the center of the display.



Attributes: Color of boxes (when testing color monitors) can be changed to any combination of primaries.

Test: **Phosphor Color Temperature**

Purpose: The phosphor(s) in a picture tube should emit the correct color (or hue) light when energized. This is particularly important when a displayed image will be photographed and the output of the monitor has to match the response of the film being used. In color work involving displaying pictures of "real" objects, the color temperature of each phosphor type must be correct in order to faithfully reproduce true-to-life pictures.

Method: (Monochrome): Center your photometer probe within the center box. Adjust the monitor's brightness control to produce the specified intensity reading on the meter. Set the meter to its color temperature function and verify that the color temperature is within specified limits.

(Color): This procedure is similar to the monochrome method except for the fact that each of the primary phosphor colors are tested and adjusted one at a time. All purity adjustments should be done prior to doing this test.

Test: **Phosphor Uniformity**

Purpose: Verify that the color of the light produced by the picture tube's phosphor is the same in all areas of the tube.

Method: Perform the "Phosphor Color Temperature" test outlined above.

In the case of a monochrome monitor, center the light meter probe in each of the corner squares while noting the color temperature reading for each square. The deviation between each of the readings and from the center reading should be within your spec limits.

In the case of a color monitor, repeat the monochrome procedure for each of the primary phosphor colors.

Test: **White Color Temperature Adjustment** (Color Monitors Only)

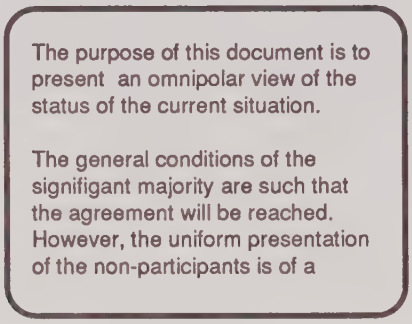
Purpose: A "White" image reproduced on a color monitor may mean a different "white" to different people. Some may prefer a warm or reddish white, while others may prefer a cooler or bluish white. Operator preferences should be eliminated to insure a consistent product.

Method: Select "White" boxes from the secondary menu. Center the photometer probe within the center box. Adjust the individual color controls to produce the correct color temperature and brightness readings on the photometer.

text

Front Panel Path: **Images** / GENERAL / text

Description: The screen is filled with random paragraphs of text using white characters on a black background. The amount of text is determined by the horizontal and vertical resolution data entered in the "Format" principal.


The purpose of this document is to present an omnipolar view of the status of the current situation.
The general conditions of the signifigant majority are such that the agreement will be reached. However, the uniform presentation of the non-participants is of a

Attributes: You may switch between white characters on a black background or black characters on a white background.

Test: **Word Processor Simulation**

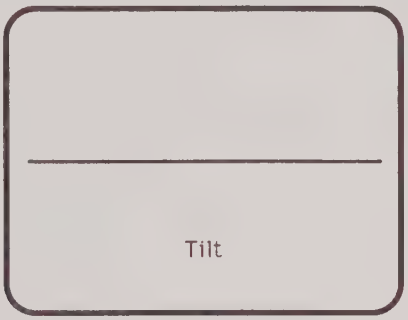
Purpose: If your monitor is used in word processor work stations, data entry terminals or other applications that call for large amounts of text to be displayed, you can use this image to simulate actual user conditions.

Method: Select the correct type of presentation from the secondary menu. Adjust your monitor's brightness and contrast controls to obtain the best image. The characters in all areas of the display should be well formed and in focus.

tilt

Front Panel Path: **Images** / SETUP / tilt

Description: A single horizontal white line is drawn on a black background. The line is centered vertically.



Attributes: No Editable attributes.

Test: Yoke Tilt

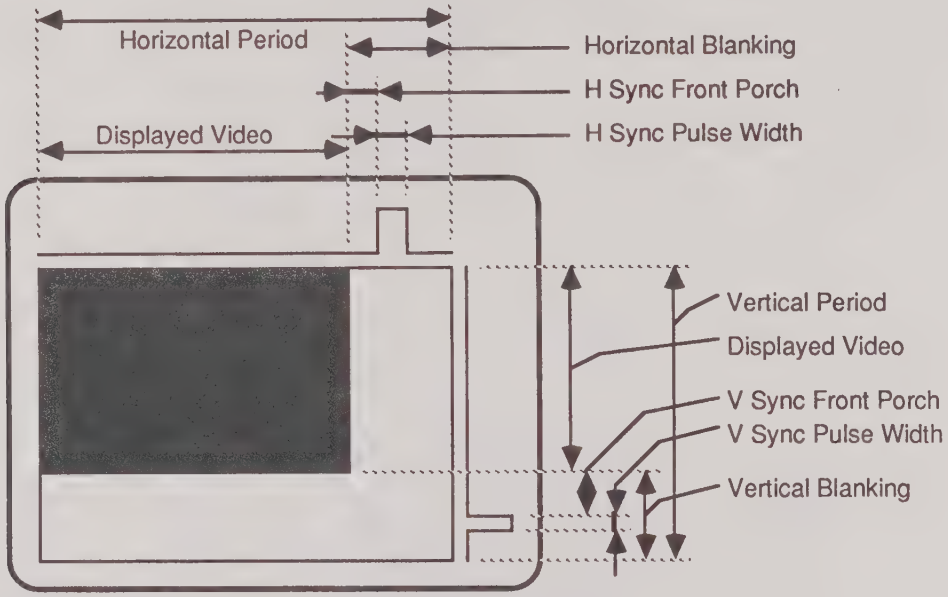
Purpose: The horizontal axis of a displayed image should line up with the horizontal axis of your monitor. Any tilt is most likely due to the yoke being twisted on the neck of the CRT.

Method: Place your monitor on a flat surface so that the face of the CRT is perpendicular to the surface. Using a ruler or gauge, measure the height of each end of the white line from the surface. The difference between the two readings should be within your spec for the monitor. If it is out of spec, the yoke will need to be adjusted. Loosen the hardware that clamps the yoke to the neck of the CRT and rotate the yoke until the line is horizontal. Tighten the yoke clamp hardware.

timing

Front Panel Path: **Images** / GENERAL / timing

Description: A white rectangular outline is drawn on a black background. Simulated waveforms are drawn above and to the right of the rectangle. A solid white rectangle is positioned in the upper left hand corner of the outline.



Attributes: No Editable attributes. The relative sizes and positions of the waveforms and patch are based on the current Format parameters.

Test: **Format Timing Display**

Purpose: This image provides a quick overview of the current "Format" driving your monitor by giving a graphic representation of the relationship between active video and blanking times as well as the sync pulse position and width. Line (horizontal) and field (vertical) timing information are represented in the two (2) dimensional display.

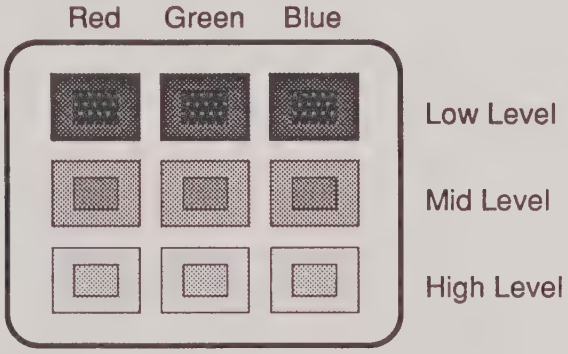
Method: The width of the rectangular outline depicts one (1) complete horizontal period. The width of the solid white rectangle represents the horizontal active video period, and the black area to the right of the patch represents the horizontal blanking period. The waveform above the outline represents a positive going horizontal sync pulse. The position and width of the sync pulse are drawn relative to the active video and blanking periods. Vertical timing is represented in a similar manner from top to bottom. The waveform to the right represents the positive going vertical sync pulse. Both sync waveforms are drawn as positive going. The actual polarities of the sync signals going your monitor are dependent upon how you connect your cables to the outputs.

track5%, track1Ø%

Front Panel Path: **Images** / COLOR / More / track5%
Images / COLOR / More / track1Ø%

Description: Nine (9) large boxes are drawn on the the screen. A smaller box, at a lower intensity level, is drawn inside each of the larger boxes. Each column of boxes is drawn with one of the primary colors.

The top row of boxes are drawn at Ø and 5 percent levels of brightness for the "track5%" image and at Ø and 1Ø percent levels for the "track1Ø%" image. The large boxes are outlined with a border at a 1ØØ% level. The middle row of boxes are drawn at 48 and 53 percent levels for the "track5%" image and at 45 and 55 percent levels for the "track1Ø%" image. The bottom row of boxes are drawn at 95 and 1ØØ percent levels for the "track5%" image and at 9Ø and 1ØØ percent levels for the "track1Ø%" image.



Attributes: No Editable attributes.

Test: **Pre-Release Evaluation Image**

trap (Trapezoid Distortion)

Front Panel Path: **Images** / GEOMETRY / trap

Description: White corner markers are drawn on a black background.

Attributes: No Editable attributes.

Test: **Trapezoid Distortion Correction**

Purpose: This image gives you a way to measure trapezoid distortion in your monitor. If the distortion is not too severe, you may be able to correct it by adding or adjusting magnets on the yoke.

Method: Perform the "Parallelogram Distortion Check" first to prevent an operator from wasting valuable time on a monitor with a defective yoke.

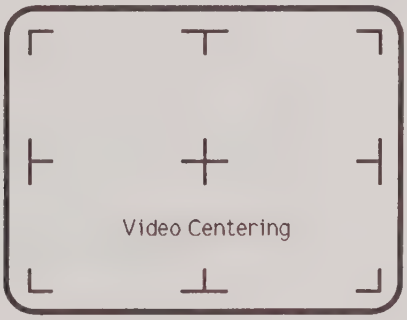
Measure the width of the image at the top and bottom of the display. Any difference in readings should be within your spec limits. Measure the height of the image at both sides of the display. Any difference in readings should be within your spec limits. If either of the differences is out of spec, the Trapezoid distortion of your monitor is out of spec.

Add or adjust magnets on the yoke to correct the problem. The "Pin & Barrel Correction" test should be repeated to make sure that it is still in spec.

v-Center (Video Centering)

Front Panel Path: **Images** / GEOMETRY / v-Center

Description: Nine (9) white markers are drawn on a black background. A marker is placed in each corner of the image. Additional markers are placed at the center of each edge of the image and at the exact center of the image.



Attributes: No Editable attributes.

Test: **Video Centering**

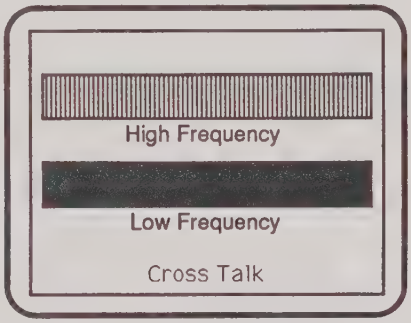
Purpose: Use this image to center the video within the raster.

Method: Turn up your monitor's brightness control to make the raster visible. Adjust your monitor's centering controls to center the image within the raster edges.

X-Talk (Cross-Talk)

Front Panel Path: **Images / FINAL / X-Talk**

Description: A white border (1 pixel wide) surrounding a black background. Two (2) horizontal bars are spaced vertically within the border and with the ends of the bars not quite touching the border. The top bar is made up of vertical lines that are one (1) pixel wide and are drawn at every other pixel location horizontally. The bottom bar is solid white rectangle that is the same size as the top bar.



Attributes: No Editable attributes.

Test: Video Cross-talk

Purpose: This image lets you see if your monitor has a cross-talk problem between the video and sync circuits.

Method: Look at the vertical portions of the border lines at either side of the bars. The lines should be perfectly straight and not offset from the remainder of the line. An offset in the same direction at both sides indicates cross-talk into the horizontal circuits. Offsets in opposite directions indicate a high voltage regulation problem. The "High Voltage Regulation" test can be used to help isolate the problem.

If the distortion appears at the top bar, then there is a problem with high frequency video getting into the horizontal sync and/or sweep circuits. If the distortion appears at the bottom bar, then there is a problem with low frequency video getting into the horizontal sync and/or sweep circuits.

barBlack

Front Panel Path: **Images** / SPECIAL / MORE / MORE / barBlack

Description: A group of horizontal black bars is drawn on a white background.

Test: **Pre-Release Evaluation Image**

briggs

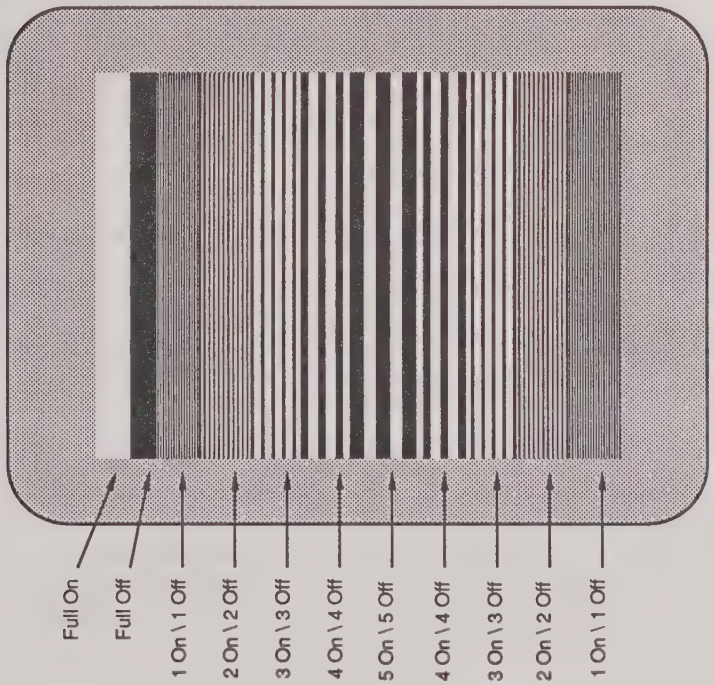
Front Panel Path: **Images** / GENERAL / briggs

Description: Image currently being developed and evaluated.

burst

Front Panel Path: **Images** / FINAL / More / burst

Description: The screen is filled with various width vertical white stripes on a black background. The stripes extend the full height of the active video. The first stripe , on the left side has a width equal to 1/2Ø of the total width of the active video. It is followed with a black stripe of the same width. The remaining 9/1Ø of the image is divided into nine (9) equally sized areas of stripes. The pixel on / off ratio for each group of stripes is shown in the illustration.



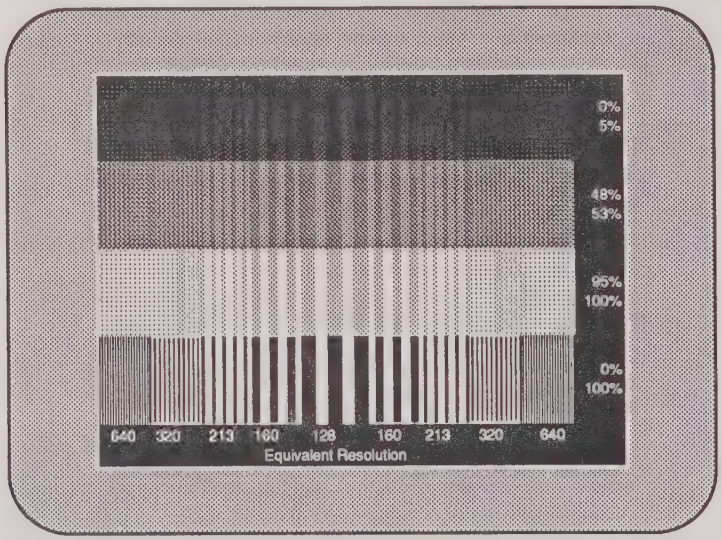
Attributes: No Editable attributes.

Test: **Pre-Release Evaluation Image**

burst-g

Front Panel Path: **Images** / FINAL / MORE / burst-g

Description: Most of the active video area is filled with vertical stripes at various duty cycles (from 1 On \ 1 Off to 5 On \ 5 Off) and intensity combinations. Each group of stripes is labeled at the bottom with the equivalent resolution. Each group of intensity combinations is labeled at the right.



Attributes: No Editable attributes.

Test: **Pre-Release Evaluation Image**

circles

Front Panel Path: **Images** / SPECIAL / MORE / MORE / circles

Description: Two white centered and concentric circles are drawn over any existing image. A white outline and corner markers are also added.

Test: **Pre-Release Evaluation Image**

dots

Front Panel Path: **Images** / SPECIAL / MORE / MORE / dots

Description: The screen is filled with wide spaced white single pixel dots.

Test: **Pre-Release Evaluation Image**

grill--H

Front Panel Path: **Images** / FINAL / MORE / grill--H

Description: The screen is filled with equally spaced white horizontal bars.

Attributes: The thickness of the bars and the spacing can be edited.

Test: **Pre-Release Evaluation Image**

grill--V

Front Panel Path: **Images** / FINAL / MORE / grill--V

Description: The screen is filled with equally spaced white vertical bars.

Attributes: The thickness of the bars and the spacing can be edited.

Test: **Pre-Release Evaluation Image**

grill15H

Front Panel Path: **Images** / SPECIAL / MORE / grill15H

Description: A white grill consisting of horizontal lines is drawn on a black background. The duty cycle is 1 line On and 5 lines Off.

Test: **Pre-Release Evaluation Image**

grill15V

Front Panel Path: **Images** / SPECIAL / MORE / grill15V

Description: A white grill consisting of vertical lines is drawn on a black background. The duty cycle is 1 line On and 5 lines Off.

Test: **Pre-Release Evaluation Image**

grill22H

Front Panel Path: **Images** / SPECIAL / MORE / grill22H

Description: A white grill consisting of horizontal lines is drawn on a black background. The duty cycle is 1 line On and 5 lines Off.

Test: **Pre-Release Evaluation Image**

grill22V

Front Panel Path: **Images** / SPECIAL / MORE / grill22V

Description: A white grill consisting of vertical lines is drawn on a black background. The duty cycle is 1 line On and 5 lines Off.

Test: **Pre-Release Evaluation Image**

grill33A

Front Panel Path: **Images** / SPECIAL / MORE / grill33A

Description: A white grill consisting of diagonal lines is drawn on a black background. The lines are drawn so that they run down and to the left. The duty cycle is 3 lines On and 3 lines Off.

Test: **Pre-Release Evaluation Image**

grill33D

Front Panel Path: **Images** / SPECIAL / MORE / grill33D

Description: A white grill consisting of diagonal lines is drawn on a black background. The lines are drawn so that they run down and to the right. The duty cycle is 3 lines On and 3 lines Off.

Test: **Pre-Release Evaluation Image**

hatch-#L

Front Panel Path: **Images** / SPECIAL / hatch-#L

Description: A large white crosshatch consisting of horizontal and vertical lines is drawn on a black background.

Test: **Pre-Release Evaluation Image**

hatch-#S

Front Panel Path: **Images** / SPECIAL / hatch-#S

Description: A small white crosshatch consisting of horizontal and vertical lines is drawn on a black background.

Test: **Pre-Release Evaluation Image**

hatch--#

Front Panel Path: **Images** / FINAL / More / hatch--#

Description: A white crosshatch image is drawn on a black background. The crosshatch is drawn using equal numbers of horizontal and vertical lines.

Attributes: The number of lines can be changed.

Test: **Pre-Release Evaluation Image**

hatch--X

Front Panel Path: **Images** / FINAL / More / hatch--X

Description: A white crosshatch image is drawn on a black background. The crosshatch is drawn using crossed diagonal lines.

Attributes: The number of lines can be changed.

Test: **Pre-Release Evaluation Image**

hatch-XL

Front Panel Path: **Images** / SPECIAL / hatch-XL

Description: A large white crosshatch consisting of crossed diagonal lines is drawn on a black background.

Test: **Pre-Release Evaluation Image**

hatch3XL

Front Panel Path: **Images** / SPECIAL / hatch3XL

Description: A large white crosshatch consisting of groups of three (3) crossed diagonal lines is drawn on a black background.

Attributes: Currently being developed and evaluated.

Test: **Pre-Release Evaluation Image**

hatch3XS

Front Panel Path: **Images** / SPECIAL / hatch3XS

Description: A small white crosshatch consisting of groups of three (3) crossed diagonal lines is drawn on a black background.

Test: **Pre-Release Evaluation Image**

window-L

Front Panel Path: **Images** / SPECIAL / MORE / MORE / window-L

Description: A large white rectangle is drawn, centered, on a black background.

Test: **Pre-Release Evaluation Image**

window-S

Front Panel Path: **Images** / SPECIAL / MORE / MORE / window-S

Description: A large white rectangle is drawn, centered, on a black background.

Test: **Pre-Release Evaluation Image**

Video Plug-in Specifications Table of Contents

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Specifications, ACF-250 Video Plug-in

Video Outputs Available

The ACF-250 is designed to drive displays having a nominal video input impedance of 50 ohms. If the target display has been designed for this impedance, then you should connect the R, G, & B outputs of the video plug-in directly to the video inputs of the target display, using the SMA-to-BNC cables provided (note: SMA-to-SMA cables are available on special order - contact your Quantum Data representative for details). If the video input impedance of the target display is 75 ohms, then you should to attach the three 150 ohm shunts (provided) to the BNC-ends of the SMA-to-BNC cables before using them to connect the video plug-in to the target display.

Sync Outputs Available

The ACF-250 is capable of generating both analog and (TTL) digital synchronization signals. If the target display requires composite-analog synchronization, then no more connections need to be made. If the target display requires separate-digital synchronization, then you will need to make one or two more connections.

Most displays that require separate-digital synchronization require two additional signals; namely, horizontal sync and vertical sync. If the target display is of this type, then you should connect the BNC outputs of the video plug-in labeled HORIZONTAL and VERTICAL to the corresponding inputs of the target display using the two BNC-to-BNC cables provided.

Some displays require a composite-digital synchronizing signal. In this case, you should connect the BNC output of the video plug-in that is labeled COMPOSITE to the corresponding input of the target display using one of the two BNC-to-BNC cables provided.

Specifications, ACF-400 Video Plug-in

Video Outputs Available

The ACF-400 is designed to drive displays having a nominal video input impedance of 50 ohms. If the target display has been designed for this impedance, then you should connect the R, G, & B outputs of the video plug-in directly to the video inputs of the target display, using the SMA-to-BNC cables provided (note: SMA-to-SMA cables are available on special order - contact your Quantum Data representative for details). If the video input impedance of the target display is 75 ohms, then you should to attach the three 150 ohm shunts (provided) to the BNC-ends of the SMA-to-BNC cables before using them to connect the video plug-in to the target display.

Sync Outputs Available

The ACF-400 is capable of generating both analog and (TTL) digital synchronization signals. If the target display requires composite-analog synchronization, then no more connections need to be made. If the target display requires separate-digital synchronization, then you will need to make one or two more connections.

Most displays that require separate-digital synchronization require two additional signals; namely, horizontal sync and vertical sync. If the target display is of this type, then you should connect the BNC outputs of the video plug-in labeled HORIZONTAL and VERTICAL to the corresponding inputs of the target display using the two BNC-to-BNC cables provided.

Some displays require a composite-digital synchronizing signal. In this case, you should connect the BNC output of the video plug-in that is labeled COMPOSITE to the corresponding input of the target display using one of the two BNC-to-BNC cables provided.

Specifications, BCF-125 Video Plug-in

Analog Video Outputs Available

Three single-ended analog video outputs are provided. Female BNC connectors are used for all three analog outputs. Each output has a nominal source impedance of 75 ohms.

The peak-to-peak swing from all three analog video outputs of the BCF-125 can be adjusted over a range of 0.5 to 1.5 volts via a single trimpot that is accessible through a small opening labeled "Amplitude". A small screwdriver is required to make this adjustment. Another trimpot, labeled "Calibration", affects the DC biasing of the analog outputs. This control must not be touched.

If the target display has red, green, and blue analog video inputs, then you should connect the RED, GREEN, and BLUE analog outputs of the BCF-125 directly to those inputs using three BNC terminated 75 ohm coaxial cables (not supplied).

When driving analog monochrome displays, just use the GREEN analog output.

If the target display requires a composite video/sync signal, then no more connections need to be made as negative-going sync pulses can be superimposed on any (or all) of the analog video outputs of the BCF-125 under program control.

If the target display requires separate digital synchronization, then you should see the section entitled "Sync Outputs Available".

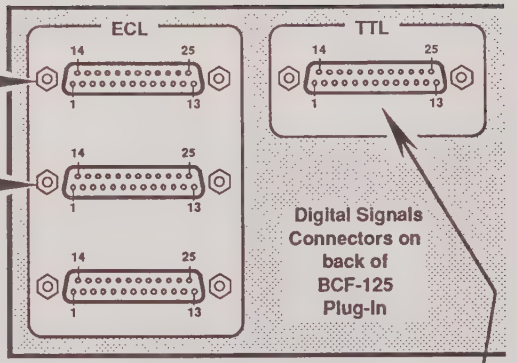
Digital Video Outputs Available

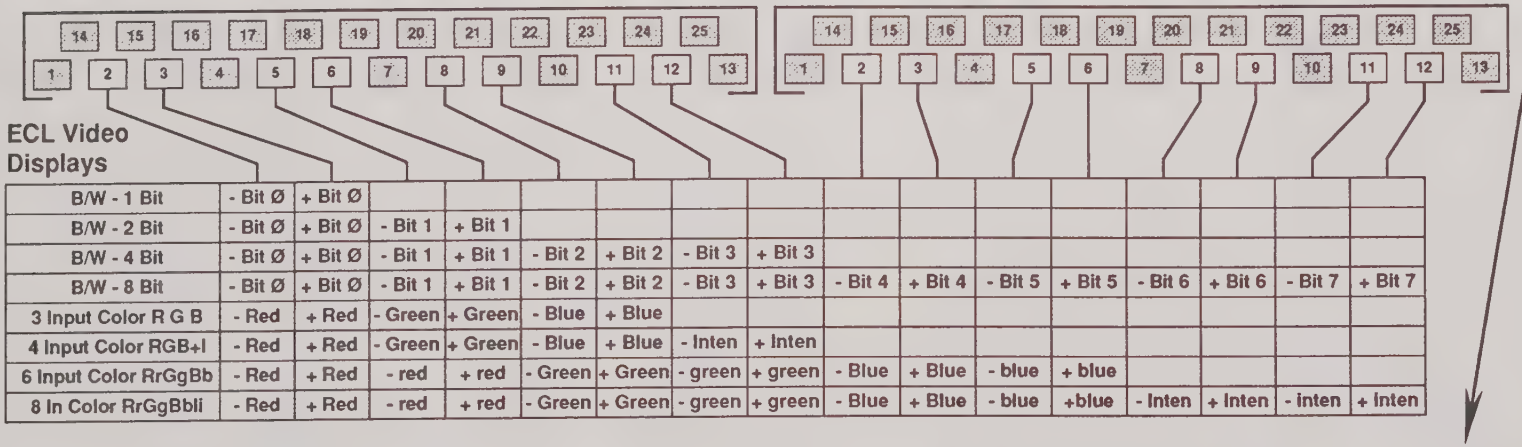
The BCF-125 provides both single-ended TTL and differential ECL digital video output signals. DB-25 (D-subminiature type) connectors are used for both types of signals. The TTL outputs have a nominal source impedance of 50 ohms, whereas the ECL outputs have a relatively low (<20 ohms) source impedance (since each ECL output is driven by the usual emitter follower). In either case, 50 ohm coax (e.g. RG-174) is recommended for all digital connections. The logical true level associated with each digital output of the BCF-125 is programmable. If ECL levels are required, then you will need to make two connections per signal.

A simple monochrome monitor will only require a single signal, whereas, a digital monochrome display that is capable of resolving shades of grey, may require up to eight. A simple 8-color display will require at least three video signals; one for each primary color. 16-color digital displays require one additional signal to control the intensity of all three primaries, simultaneously. 64-color displays require three separate intensity inputs - one for each primary. The BCF-125 can also provide signals for 256-color displays that utilize both global and individual primary intensity controls.

Once you have determined the type and number of video signals that are required, refer to the figure on the next page which shows a partial layout of the BCF-125. In this figure you will find two charts showing the connections required for both ECL and TTL video hookups. The display types that are currently supported are listed at the left side of each chart.

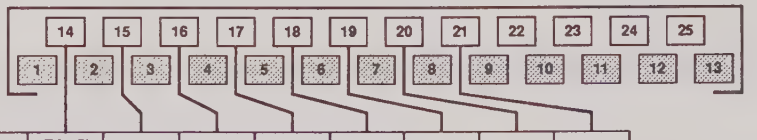
Displays requiring a digital video signal will also require one or two additional signals for synchronization, then you should see the section entitled "Sync Outputs Available".





ECL Video Displays

B/W - 1 Bit	- Bit Ø	+ Bit Ø														
B/W - 2 Bit	- Bit Ø	+ Bit Ø	- Bit 1	+ Bit 1												
B/W - 4 Bit	- Bit Ø	+ Bit Ø	- Bit 1	+ Bit 1	- Bit 2	+ Bit 2	- Bit 3	+ Bit 3								
B/W - 8 Bit	- Bit Ø	+ Bit Ø	- Bit 1	+ Bit 1	- Bit 2	+ Bit 2	- Bit 3	+ Bit 3	- Bit 4	+ Bit 4	- Bit 5	+ Bit 5	- Bit 6	+ Bit 6	- Bit 7	+ Bit 7
3 Input Color R G B	- Red	+ Red	- Green	+ Green	- Blue	+ Blue										
4 Input Color RGB+I	- Red	+ Red	- Green	+ Green	- Blue	+ Blue	- Inten	+ Inten								
6 Input Color RrGgBb	- Red	+ Red	- red	+ red	- Green	+ Green	- green	+ green	- Blue	+ Blue	- blue	+ blue				
8 In Color RrGgBbIi	- Red	+ Red	- red	+ red	- Green	+ Green	- green	+ green	- Blue	+ Blue	- blue	+blue	- Inten	+ Inten	- inten	+ Inten



TTL Video Displays

B/W - 1 Bit	Bit Ø							
B/W - 2 Bit	Bit Ø	Bit 1						
B/W - 4 Bit	Bit Ø	Bit 1	Bit 2	Bit 3				
B/W - 8 Bit	Bit Ø	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
3 Input Color R G B	Red	Green	Blue					
4 Input Color RGB+I	Red	Green	Blue	Inten				
6 Input Color RrGgBb	Red	red	Green	green	Blue	blue		
8 In Color RrGgBbIi	Red	red	Green	green	Blue	blue	Inten	inten

Notes:

1) Contact Quantum Data for information on connecting displays not listed in charts.
2) Synchronization connections shown on another chart.
3) ECL outputs are differential. The "+" output of each signal follows the True level as defined in the Format.
4) Single ended operation of the ECL outputs should not be used.
5) Female DB-25S (25 position, Female D-Sub) receptacles are used for the outputs.
6) Connector pin numbers having a shaded background indicate that the contacts are connected to the Video Plug-in's signal ground.

Connecting Digital Video Displays to the BCF-125

Sync Outputs Available

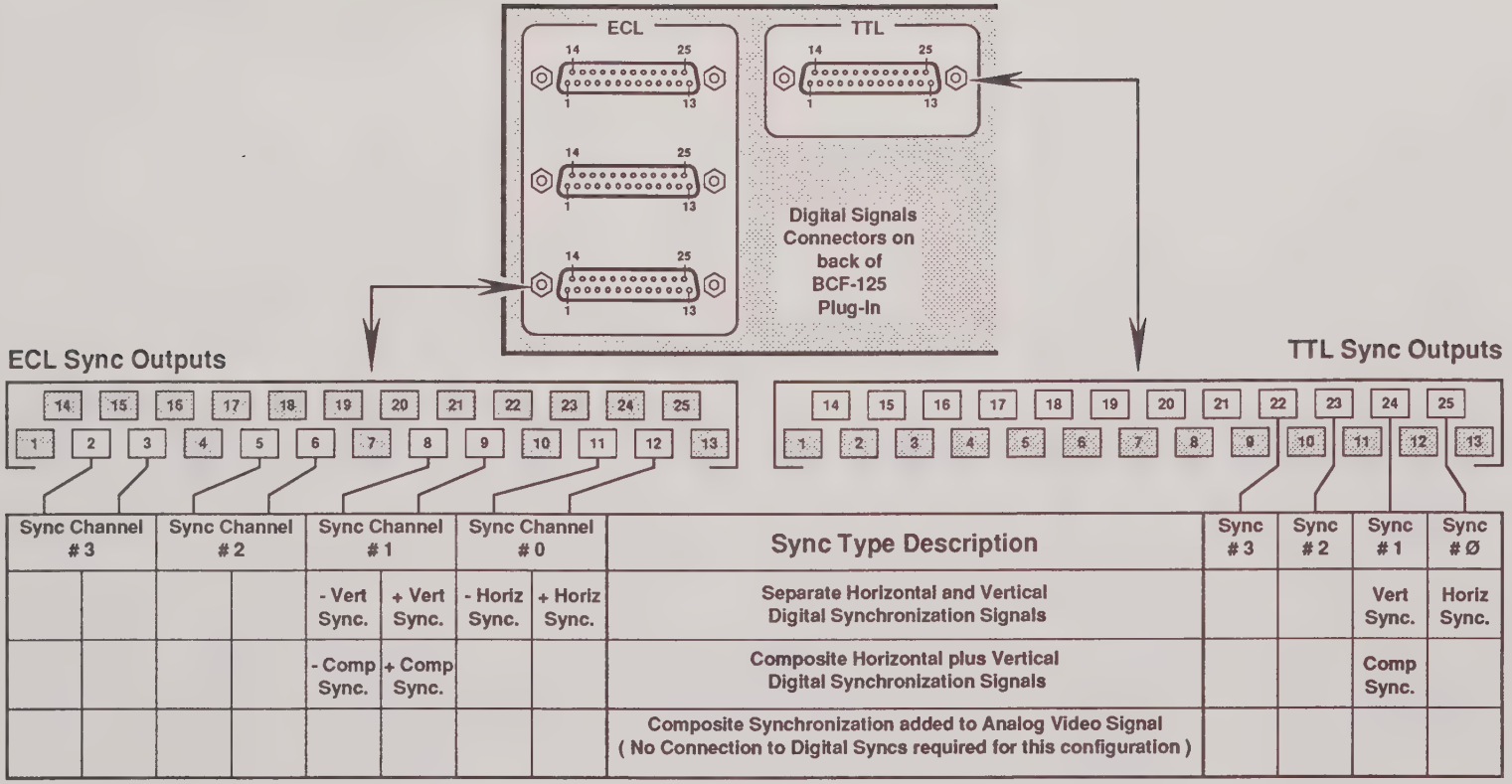
The BCF-125 video plug-in generates both ECL and TTL digital synchronization signals. The ECL synchronization signals are available on a DB-25 connector that is separate from two connectors that are used to deliver the ECL video signals. The TTL synchronization signals, on the other hand, come out on the same DB-25 connector that the TTL video signals do. Some ECL video displays use TTL levels for their sync inputs. If ECL level sync is required, then you will have to make two connections per signal.

Note that the logical true level associated with each digital output of the BCF-125 can be changed under program control.

First, determine if your target display requires a separate or combined horizontal and vertical synchronizing signal.

The chart on the next page shows the connections required for each type of sync hookup. The sync types that are supported are listed at the center of the chart.

Note that the logical true level associated with each digital output of the BCF-125 can be changed under program control.



Sync Channel #3		Sync Channel #2		Sync Channel #1		Sync Channel #0		Sync Type Description	Sync #3	Sync #2	Sync #1	Sync #Ø
				- Vert Sync.	+ Vert Sync.	- Horiz Sync.	+ Horiz Sync.	Separate Horizontal and Vertical Digital Synchronization Signals			Vert Sync.	Horiz Sync.
				- Comp Sync.	+ Comp Sync.			Composite Horizontal plus Vertical Digital Synchronization Signals			Comp Sync.	
								Composite Synchronization added to Analog Video Signal (No Connection to Digital Syncs required for this configuration)				

Notes:

1) Contact Quantum Data for information on sync types not listed in charts.
2) Digital Video connections shown on another chart.
3) ECL outputs are differential. The "+" output of each signal follows the True level as defined in the Format
4) Single ended operation of the ECL outputs should not be used.
5) Female DB-25S (25 position, Female D-Sub) receptacles are used for the outputs.
6) Connector pin numbers having a shaded background indicate that the contacts are connected to the Video Plug-in's signal ground.

Connecting a Video Display's Syncs to the BCF-125

Specifications, D-403S Video Converter

The D-403S is designed to convert the analog video outputs of an ACF-250 or ACF-400 Video Plug-in. The signals are converted from analog levels to differential ECL outputs. The conversion is done by three discreet single bit analog-to-digital converters. The transition point of the converter is at approximately the mid-point of the analog video level. Power for the converter is supplied through a two conductor cable that plugs into a mating connector on the mainframe's power panel.

You should only use images that draw with pixels that are either fully on or fully off. images that contain gray scale information will produce unsatisfactory results when used with the D-403S.

Specifications, 8701 Mainframe

AC Power Requirements

The range of AC operating voltages is user selectable as shown in the following chart. The voltage selector is located inside of the power inlet module. A section in the "Operating Tasks" chapter lists the procedure for selecting the line voltage.

Selector Setting	Operating Range	Fuse Required
1ØØVac	9Ø thru 11Ø Vac	3.Ø Amp @ 25Ø Volts
12ØVac	1Ø8 thru 132 Vac	3.Ø Amp @ 25Ø Volts
22ØVac	198 thru 24Ø Vac	1.5 Amp @ 25Ø Volts
24ØVac	216 thru 264 Vac	1.5 Amp @ 25Ø Volts

Operating Frequency: 47 thru 63 Hz (sinusoidal)

Fuse Type: Buss MSL type (or equivalent)

EIA Sync Hardware

Features

- Supports all forms of EIA composite sync by providing optional vertical serrations and equalizing pulses (per EIA-343-A and EIA-170-A).
- Improves interlace.
- Eliminates "flagging" effect at the top of the picture on some displays.

Specifications

Types of Sync Provided (see following figure for timing information)

HS	Separate horizontal sync.
VS	Separate vertical sync.
CS-ORed	Composite horizontal ORed with vertical sync.
CS-SH	Composite w/half-width serrations at 1X the line rate
CS-SF	Composite w/full-width serrations at 1X the line rate
CS-SF2	Composite w/full-width serrations at 2X the line rate
CS-SF2EQ	Composite w/full-width serrations at 2X the line rate and equalizing pulses.

Horizontal Sync Pulse Parameters

Delay:	1 pixel increments from 0 to the end of the line blanking interval.
Pulse Width:	200ns steps from 400ns to the width of the line blanking interval.

Vertical Sync Pulse Parameters

Delay:	1 line increments from 0 to the end of the field blanking interval.
Width:	1 line increments from 1 to the width of the field blanking interval.

Vertical Serration Parameters

Frequency:	Selectable 1X or 2X the line rate
Width:	Selectable to be either half or full horizontal sync pulse width

Equalizing Pulse Parameters

Frequency:	2X the line rate
Width:	1/2 the width of the horizontal sync pulse

Scanning Parameters

Modes:	Selectable interlace or non-interlace

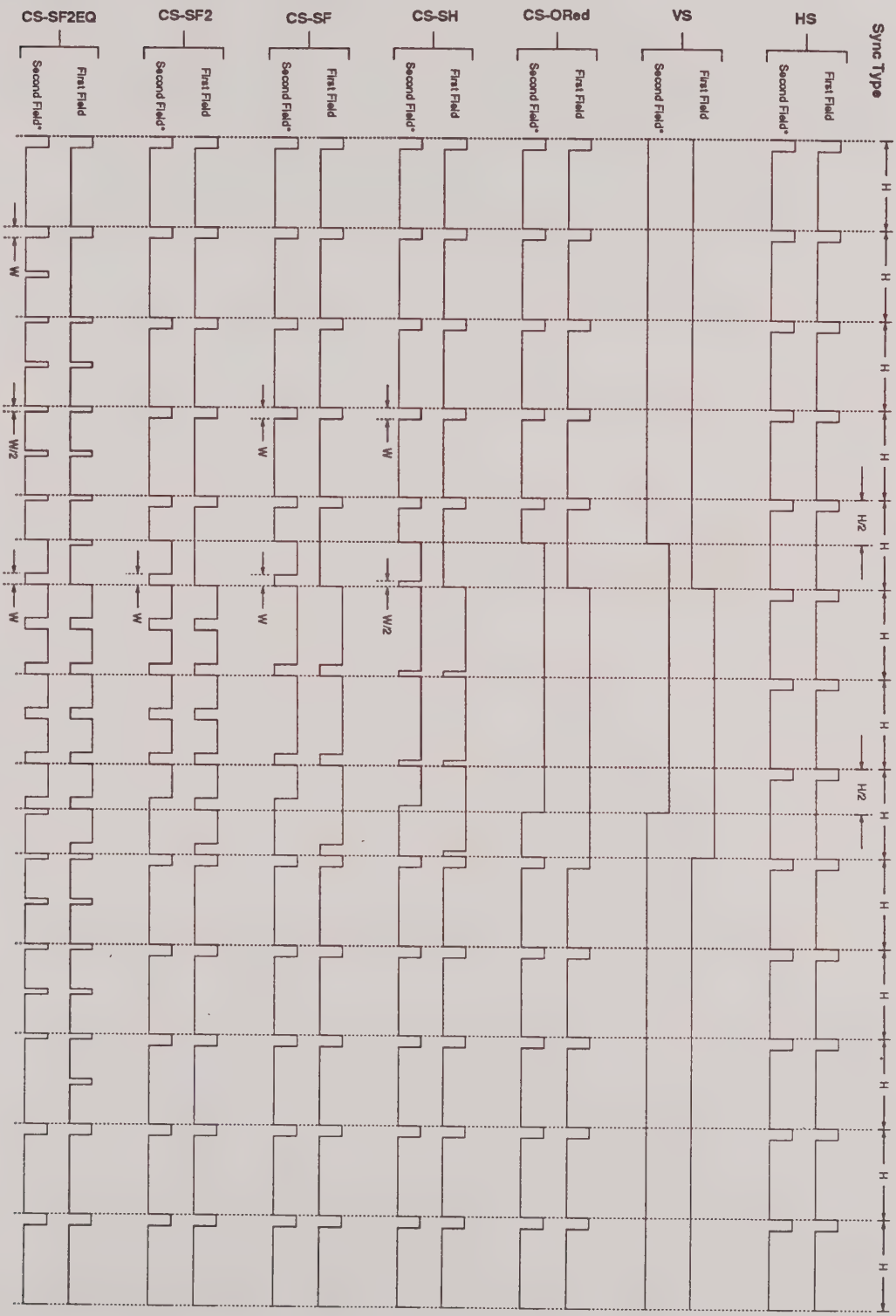
The following chart shows where the various sync signals are outputed for a specific type of video plug-in. The current version of the operating system software supoorts the ACF-250, ACF-400 and BCF-125 plug-ins. You should normaly configure the sync outputs from the "DSSignal" sub-menu of the Format Options menu. This will insure proper operation of the ouputs. If you get an error message or faulty outputs, you should check the following:

- Make sure that the EIA sync hardware is installed in the 8701 mainframe. A label on the back of the mainframe identifies units with the hardware installed.
- Make sure that the operating system software is properly installed (configured). The configuration data is didplayed during the normal boot-up procedure. If the configuration is wrong, you will have to perform the "Install" macro funtion.
- Configure the sync outputs using the available "DSSignal" sub-menu choices. Attempting to configure the sync outputs using the selections in the "DSOutput" sub-menu may lead to invalid hardware configurations.

EIA Sync Hookup							
BCF-125				ACF-400 and ACF-250			
Output	No Serrattions	H Serrations	H/2 Serrations	Output	No Serrattions	H Serrations	H/2 Serrations
S0	HS	HS	Void	Horizontal	HS	HS	Void
S1	VS CS-ORed	CS-SH CS-SF	CS-SF2 CS-SF2EQ	Vertical	VS	Void	Void
S2	Void	Void	Void	Composite	CS-ORed	CS-SH CS-SF	CS-SF2 CS-SF2EQ
S3	PelClock	PelClock	PelClock	Special	Void	Void	Void
Analog	CS-ORed	CS-SH CS-SF	CS-SF2 CS-SF2EQ	Analog	CS-ORed	CS-SH CS-SF	CS-SF2 CS-SF2EQ

The waveforms on the following page show the effects of the various sync choices on the outputs.

EIA Sync Timing



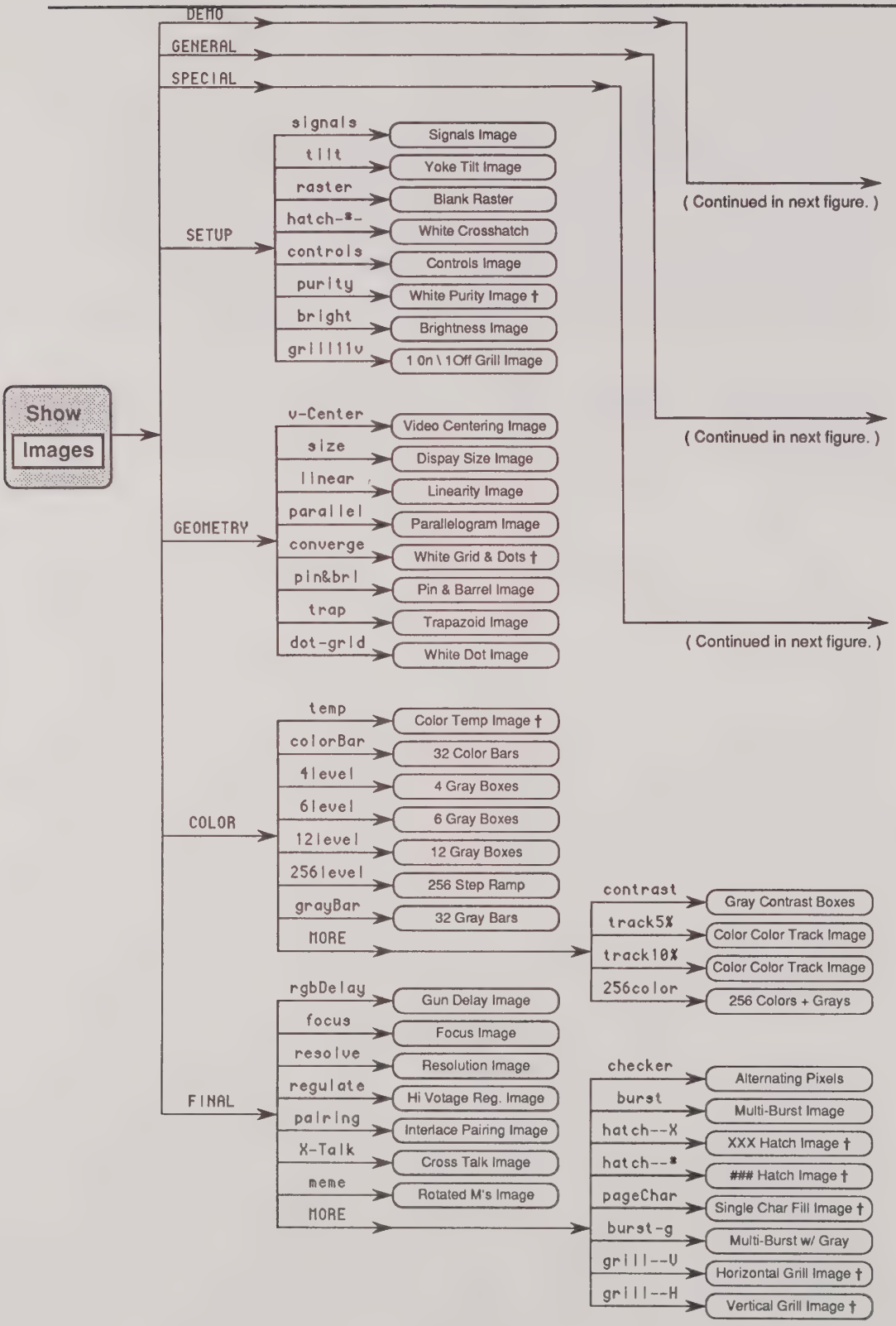
* the second field of a two field frame when in the interlace mode (this field is omitted when in the non-interlace mode)

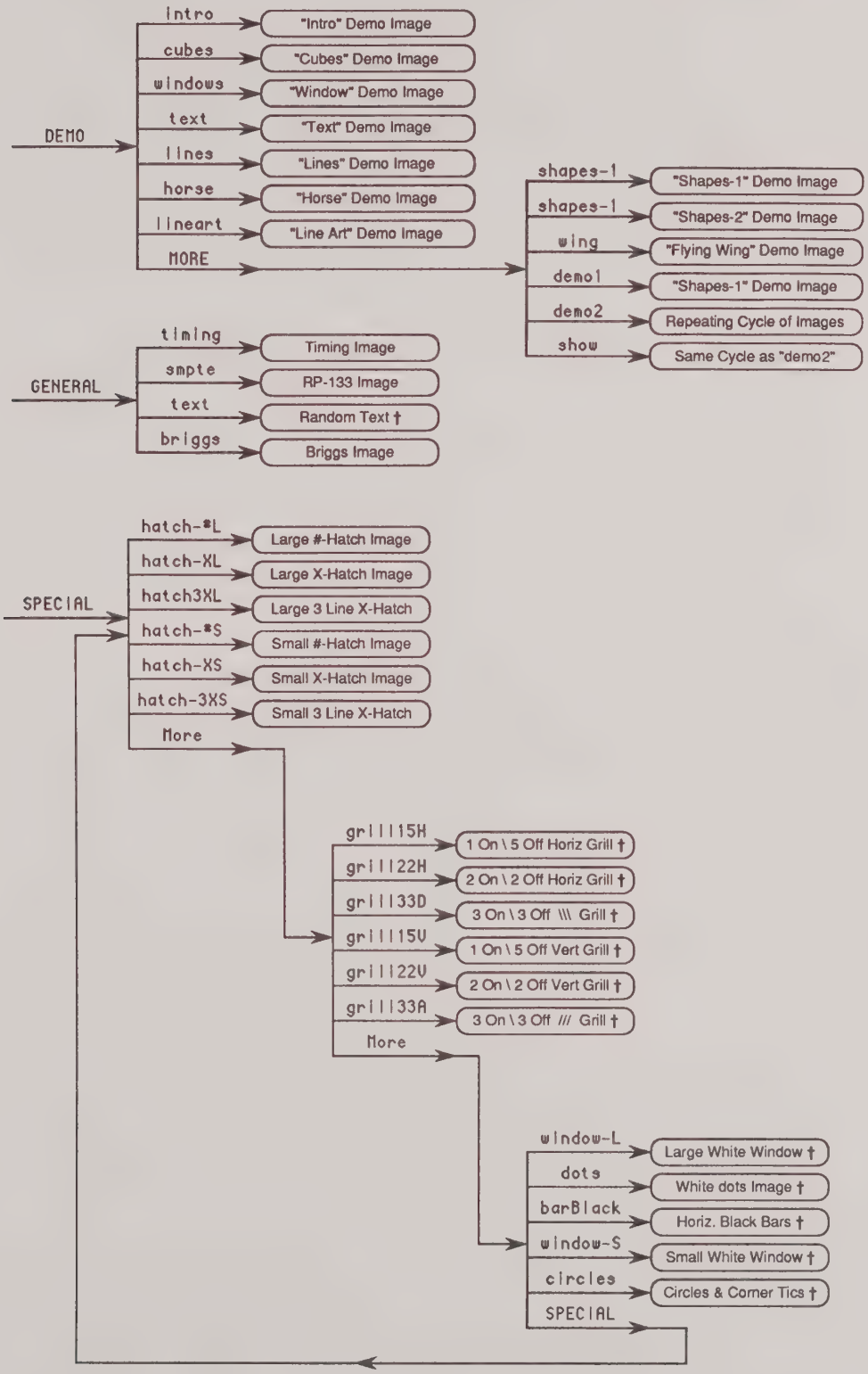
Image Menu Tree Diagram

The tree diagram on the next two (2) facing pages shows how to access the 8701's built in images. Starting at the left-hand side of the first page, you will see a rectangle labeled "Images" (It is in a larger box labeled "Show"). This represents a button on the front panel of the 8701. Pressing this button will cause the main "Images" menu to appear on the LCD. By following the path, from the button on the diagram, you will see that it divides into eight (8) other paths. Each of these paths has a label, such as "General", at its beginning. These labels are the button labels that appear on the LCD. Pressing the "Select" button adjacent to a particular label will select the matching path. Eventually, at the ends of most paths, you will find a rounded rectangle. This represents the image that is actually drawn.

You will note that some of the pattern descriptions, within the rounded rectangles, have a small dagger symbol (†). These patterns have attributes that can be changed by the user.

A separate chapter of this manual is devoted to describing each of the test images and any editable attributes.


Show Images
DEMO
GENERAL
SPECIAL
SETUP
signals
Signals Image
tilt
Yoke Tilt Image
raster
Blank Raster
hatch-*-
White Crosshatch
controls
Controls Image
purity
White Purity Image †
bright
Brightness Image
grilllv
1 On \ 1Off Grill Image
(Continued in next figure.)
GEOMETRY
v-Center
Video Centering Image
size
Dispay Size Image
linear
Linearity Image
parallel
Parallelogram Image
converge
White Grid & Dots †
pin&brl
Pin & Barrel Image
trap
Trapazoid Image
dot-grid
White Dot Image
(Continued in next figure.)
COLOR
temp
Color Temp Image †
colorBar
32 Color Bars
4level
4 Gray Boxes
6level
6 Gray Boxes
12level
12 Gray Boxes
256level
256 Step Ramp
grayBar
32 Gray Bars
MORE
contrast
Gray Contrast Boxes
track5%
Color Color Track Image
track10%
Color Color Track Image
256color
256 Colors + Grays
FINAL
rgbDelay
Gun Delay Image
focus
Focus Image
resolve
Resolution Image
regulate
Hi Votage Reg. Image
pairing
Interlace Pairing Image
X-Talk
Cross Talk Image
meme
Rotated M's Image
MORE
checker
Alternating Pixels
burst
Multi-Burst Image
hatch--X
XXX Hatch Image †
hatch--*
Hatch Image †
pageChar
Single Char Fill Image †
burst-g
Multi-Burst w/ Gray
grill--V
Horizontal Grill Image †
grill--H
Vertical Grill Image †


DEMO
intro
"Intro" Demo Image
cubes
"Cubes" Demo Image
windows
"Window" Demo Image
text
"Text" Demo Image
lines
"Lines" Demo Image
horse
"Horse" Demo Image
lineart
"Line Art" Demo Image
MORE
shapes-1
"Shapes-1" Demo Image
shapes-1
"Shapes-2" Demo Image
wing
"Flying Wing" Demo Image
demo1
"Shapes-1" Demo Image
demo2
Repeating Cycle of Images
show
Same Cycle as "demo2"
GENERAL
timing
Timing Image
smpte
RP-133 Image
text
Random Text †
briggs
Briggs Image
SPECIAL
hatch-*L
Large #-Hatch Image
hatch-XL
Large X-Hatch Image
hatch3XL
Large 3 Line X-Hatch
hatch-*S
Small #-Hatch Image
hatch-XS
Small X-Hatch Image
hatch-3XS
Small 3 Line X-Hatch
More
grill5H
1 On \ 5 Off Horiz Grill †
grill2H
2 On \ 2 Off Horiz Grill †
grill3D
3 On \ 3 Off \\\ Grill †
grill5V
1 On \ 5 Off Vert Grill †
grill2V
2 On \ 2 Off Vert Grill †
grill3A
3 On \ 3 Off /// Grill †
More
window-L
Large White Window †
dots
White dots Image †
barBlack
Horiz. Black Bars †
window-S
Small White Window †
circles
Circles & Corner Tics †
SPECIAL

8701 FORTH Words (version 2.8)

Many of the FOX functions required for normal operation were created using the FORTH language. The functions, as well as the language itself, are loaded from disk as part of the 8701's normal boot-up procedure. Many of the functions are available to the user by connecting a terminal to the 8701's RS-232C serial port. A section in the "Reference" chapter has additional information on the port. By sending various FORTH commands you can load Format and Image files as well as draw your own images. The current version of the operating system does not support editing and saving FORTH programs to the 8701's disk drive.

The information in this section is not intended to be a "How to ..." FORTH programming tutorial. If you are not familiar with FORTH, we recommend that obtain one or more textbooks on the subject. Two such books are *Starting FORTH* and *Thinking FORTH*, both by Leo Brodie.

The list of FORTH words on the following pages represent a small portion of the words actually used by the 8701. Many of the FORTH-79 standard words are also supported. Many more words that are not in the list are intended for internal use by the operating system and may produced erratic results if executed by the user. The FORTH that is used by the 8701 implements 32-bit signed integer operations.

Each entry in the list consists of three parts as shown here:

WORD (stack before -- stack after)

Explanation of what the word does.

The word that is being explained is shown in boldface type at in the left-hand column of the page. To the right of the word, in parenthesis, you will find the conditions of the user stack both before and after the word is executed. A brief explanation of what the word does is given directly below the stack notation.

A brief explanation of the user stack may be in order. The stack is used for passing parameter values to and from the words. Numbers are placed on the stack by typing them in on the prior to typing in the word that you wish to execute. Multiple values are entered by separating each value with one or more blank spaces. The word will them pull the numbers off of the stack as it needs them. In some cases a FORTH word may leave something on the stack to be used by other words. Some words do need any numbers on the stack and they do not leave anything on the stack. The following example shows how the stack is used to pass parameters to a FORTH word.

> The word " **VECTOR** " needs two pairs of coordinates to draw a line. The stack notation, (x1 \ y1 \ x2 \ y2 --), shows that the word expects four (4) numbers on the stack. The notation shows that the numbers are consumed by the word and that the word does not leave any numbers on the stack. To draw a short line that starts at the upper left-hand corner of your display and extends to the coordinate 200 (x), 300 (y), you would type in the following command followed by a carriage return:
>
> ```
> Ø Ø 2ØØ 3ØØ VECTOR
> ```

%-BLUE (--)

Select the yellow pen (must use standard LUT) for drawing.

%-GREEN (--)

Select the magenta pen (must use standard LUT) for drawing.

%-RED (--)

Select the cyan pen (must use standard LUT) for drawing.

%BLUE (--)

Select the blue pen (must use standard LUT) for drawing.

%GREEN (--)

Select the green pen (must use standard LUT) for drawing.

%RED (--)

Select the red pen (must use standard LUT) for drawing.

%WHITE (--)

Select the white pen (must use standard LUT) for drawing.

+FILL (--)

Fill BOXes and CIRCLEs.

+MOVETO (Δx \ Δy --)

Move the graphics cursor relative to its current location.

+PATTERN (--)

Pattern fill BOXes and CIRCLEs.

+REPLACE (--)

Turn transparency off.

-FILL (--)

Outline BOXes and CIRCLEs.

-PATTERN (--)

Solid fill BOXes and CIRCLEs.

-REPLACE (--)

Turn transparency on.

?MORE-PENS (many -- flag)

Maybe modify format to provide a # of pens.

?MORE-PIXS (many -- flag)

Maybe modify current format to provide a given number of pictures.

BLACK_TEXT (--)

Select the black pen (must use standard LUT) for drawing.

CENTER (-- x \ y)

Return coordinates of the center of view.

CURRENTPOINT (-- x \ y)

Return coordinates of the current graphics cursor location.

DRAW-PICTURE! (index --)

Select picture being drawn.

FILL? (-- flag)

Return fill status flag.
(0 = outline, -1 = fill).

LAST-PEN! (--)

Select the last, highest numbered, pen (which is usually white that is currently available.

MOVETO (x \ y --)

Move the graphics cursor to a given location.

PATTERN? (-- flag)

Return pattern / solid status flag.
(0 = solid, -1 = patterned)

PEN! (index --)

Pick up the specified pen (0-3, 0-15, or 0-255) to use for drawing.

PEN@ (-- index)

Return the index of the pen currently selected for drawing.

PICTURE! (index --)

Select picture to be both displayed & drawn.

REPLACE? (-- flag)

Return transparency status flag.
(0 = transparent , -1 = opaque)

RESTORE-FORMAT (--)

Restore format, if it has been modified, to unmodified state.

SELECT_PATN (index --)

Select pattern (0-64) used for fills.

SHOW-PICTURE! (index --)

Select picture that is to be displayed.

XEXTENT (-- width)

Return width of view in pixels.

XLIMIT (-- right)

Return x ordinate of right-most edge of the view.

YEXTENT (-- height)

Return pixel height of the view.

YLIMIT (-- bottom)

Return y ordinate of bottom-most edge of view.

SELECT_COLOR (index --)

Select color within the LUT (0-3, 0-15, 0-255).

SELECT_PRIMARY (mask --)

Select the primary mask (0-7, 0=none 7=all).

SET_CODE (code --)

Set digital LUT output code (0-255).

SET_LEVEL (levels --)

Set level(s) using primary mask (0-255).

SET_LEVELGRAY (level --)

Set all primaries to same level (0-255).

SET_LEVELGRAYPERCENT

(percent --)

Set all primaries to same level (0-100).

SET_LEVELRGB (red level \ green level \ blue level --)

Set all primaries independently (0-255).

SET_LUTACCESS (mode --)

Open or close the LUT.
(3 = open , 0 = close)

8COLOR-ALUT (--)

Select 8 color digital LUT.
(Black, White, Red, Green, Blue, Yellow, Cyan and Magenta)

16COLOR-ALUT (--)

Select 16-color LUT.
(Full and half intensity levels of Black, White, Red, Green, Blue, Yellow, Cyan and Magenta)

16COLOR-DLUT (--)

Select 16 color digital LUT.
(Two levels each of Black, White, Red, Green, Blue, Yellow, Cyan and Magenta)

256GRAY-ALUT (--)

Select 256-gray level LUT
(linear grayscale stairstep w/ 256 steps).

DLUT-DIRECT (# of steps --)

Select Digital LUT with given equally spaced codes.

GRAY-ALUT (# of steps --)

Select Gray LUT with given equally spaced levels.

INIT-2COLORS (--)

Select black and white LUT.

+VECTORTO (Δx \ Δy --)

Plot a one pixel thick line starting at the current graphics cursor location. The end of the line is a given relative to the starting point. The location of the graphics cursor is moved to the end of the line.

BOX (x1 \ y1 \ x2 \ y2 --)

Plot a rectangle having diagonally opposite corners located at the coordinates (x1,y1) and (x2,y2).

CIRCLE (x \ y \ radius --)

Plot circle with given center point and radius.

CLEAR (--)

Clear the view with pen 0 (black).

DOT (x \ y --)

Plot single pixel at given location.

DRAW_LINE (x1 \ y1 \ x2 \ y2 --)

Plot a line between two given points.

DRAW_OVAL (width \ height \ x \ y --)

Plot a solid oval defined by a rectangular frame of a given width and height, in pixels, and having the top left corner located at the given coordinate.

DRAW_RECT (width \ height \ x \ y --)

Plot a rectangular outline of a given width and height, in pixels, and having the top left corner located at the given coordinate.

FILL_OVAL (width \ height \ x \ y --)

Draw a solid oval defined by a rectangular frame of a given width and height, in pixels, and having the top left corner located at the given x,y coordinate.

FILL_RECT (width \ height \ x \ y --)

Draw a solid rectangle of a given width and height, in pixels, and having the top left corner located at the given x,y coordinate.

PATNFILL_RECT (width \ height \ x \ y --)

Draw a pattern filled rectangle of a given width and height, in pixels, and having the top left corner located at the given x,y coordinate.

VECTOR (x1 \ y1 \ x2 \ y2 --)

Plot a one pixel thick line starting at the coordinate x1,y1 and ending at x2,y2.

VECTORTO (x \ y --)

Plot a one pixel thick line starting at the current graphics cursor location and ending at the given coordinate. The location of the graphics cursor is moved to the end of the line.

MIRROR_RECT (width \ height \ x \ y \ flag --)

Flip rectangular area of a given width and height, in pixels, and having the top left corner located at the given coordinate.

NEGATE-VIEW (--)

Perform a boolean NOT operation on all data in the current picture (White<->Black).

LOAD_IMAGE ($addr--)

Load a named Image file whose name is stored at $addr. The file extension is not part of the name. For example, to load the default Image (newimage), enter the following:

```
" newimage" LOAD_FORMAT
```

" (-- $addr)

Return the address of a given string that ends with a quotation mark. Used in the form:

```
" abcdefg"
```

Will leave the address of the string **abcdefg** on the stack.

+BOXED (--)

Draw text with a black rectangular background.

+FIXED (--)

Fix spacing between characters using T.BLOCK.

-BOXED (--)

Draw text without a black rectangular background.

-FIXED (--)

Use proportional spacing between characters.

.FONT (--)

Display the name of the current font.

AUSTIN25 (-- addr)

Return address of the AUSTIN25 font.

BOXED? (-- flag)

Return boxed staus flag (0=normal -1=boxed).

CORPUS_CHRISTI16 (-- addr)

Return address of the CORPUS_CHRISTI16 `font`.

COUNT (addr -- addr \ count)

Convert string address to address' & count.

FARGO22 (-- addr)

Return address of the FARGO22 font.

FARGO38 (-- addr)

Return address of the FARGO38 font.

FIXED? (-- flag)

Return fixed flag (0=proportional -1=fixed) .

FOCUS16 (-- addr)

Return address of the FOCUS16 font.

FONT! (addr --)

Set the current font to the font stored at the given address.

HOUSTON14 (-- addr)

Return address of the HOUSTON14 font.

INSTALL_FONTS (--)

Install standard fonts.

T. (n --)

Pop number off FORTH stack and draw it beginning at the current text cursor location.

T.BLOCK (width \ height --)

Set the width and height , in pixels, of a character block to a fixed size.

T.CR (--)

Perform a carriage-return line-feed operation on the text cursor location.

T.CURRENTPOINT (-- x \ y)

Return the current text cursor location.

T.EMIT (code --)

Draw character given ASCII code (0-255).

T.HOME (--)

Move the text cursor to upper-left corner.

T.INIT (--)

Initialize text drawing state.

T.MOVETO (x \ y --)

Move the text cursor to a given location.

T.R (n \ # of digits --)

Pop number and draw it right-justified in a field of a given number of digits beginning at the current text cursor location.

T.SPACE (--)

Type a space (to right of current location).

T.SPACES (# of spaces --)

Type a given number of spaces.

T.TYPE (addr \ count --)

Draw text string given its address and count beginning at the current text cursor location.

TI_ROMAN52 (-- addr)

Return address of the TI_ROMAN52 font.

TYPESTRING (addr --)

Draw the text string, starting at the given address, beginning at the current text cursor location.

GET_ANIMATION (-- mode)

Return animation mode
(0 = disabled, 1 = enabled)

GET_FRAMEPERPIX (-- number of frames)

Return picture period for animation.

GET_PELDEPTH (-- depth)

Return depth of each picture (bits-per-pixel).

GET_PIXDPY (-- index)

Return index of picture being displayed.

GET_PIXDRAW (-- index)

Return index of picture being drawn.

GET_PIXEXTX (-- width)

Return width of each picture (pixels).

GET_PIXEXTY (-- height)

Return height of each picture (lines).

GET_PIXFIRST (-- index)

Return index of picture to be displayed first.

GET_PIXLAST (-- index)

Return index of picture to be displayed last.

GET_PIXMANY (-- n)

Return the number of available pictures.

SET_ANIMATION (mode --)

Set animation mode.
(0 = disable, 1 = enable)

SET_FRAMEPERPIX (number of frames --)

Set picture period for animation.

SET_PIXDPY (index --)

Select picture to be displayed.

SET_PIXDRAW (index --)

Select picture to draw into.

SET_PIXFIRST (index --)

Select picture to be displayed first.

SET_PIXLAST (index --)

Select picture to be displayed last.

+MODIFIED (--)

Indicate that the current signal format has been changed.

?SNAPSHOT-FORMAT (--)

Take a snapshot of the current video signal format if it has not been modified.

amendVideo (--)

Setup video signal generating hardware using the current set of parameters (does error checking first).

GET_FTOTAL (-- n)

Return the period of a frame (in lines).

GET_LRATE (-- n)

Return the line rate (truncated to nearest Hz).

LOAD_FORMAT ($addr--)

Load a named Format file whose name is stored at $addr. The file extension is not part of the name. For example, to load the default Format (formatØØ), enter the following:

```
" formatØØ" LOAD_FORMAT
```

RESTORE-FORMAT (--)

Restore format to unmodified state using previous snapshot.

Text / Graphics Example

```
T.INIT                          \ Initialize the text state.
INSTALL_FONTS                   \ Install standard fonts.

3 SET_LUTACCESS                 \ Blank video and access the LUT.
8COLOR-ALUT                     \ Setup the LUT for 8 colors 0-7.
0 SET_LUTACCESS                 \ Unblank video and de-access the LUT.

CLEAR                           \ Clear the view.

%BLUE                           \ Pick up the blue pen.
0 0 XLIMIT YLIMIT VECTOR        \ Plot a line from upper-left to
                                \ lower- right.

%GREEN                          \ Pick up the green pen.
CENTER 50 CIRCLE                \ Plot centered circle with radius of
                                \ 50 pixels.

%RED                            \ Pick up the red pen.
-FILL                           \ Turn off fill and just outline
                                \ things.
0 0 XLIMIT YLIMIT BOX           \ Plot outline around perimeter of
                                \ the view.

%WHITE                          \ Pick up the white pen.
FARGO38 FONT!                   \ Select the FARGO38 font.
40 40 T.MOVETO                  \ Move the text cursor to location
                                \ x=40 y=40.
" This is a test." TYPESTRING   \ Type the given string at this
                                \ location.
```

```
?SNAPSHOT-FORMAT            \ Maybe save current signal format (if it
                            \ hasn't been modified) for futurerestore.

0 SET_PIXFIRST              \ Display picture 0 first.
1 SET_PIXLAST               \ Display picture 1 last.

100                         \ Put scale factor on stack.
GET_LRATE GET_FTOTAL /      \ Put frame rate (in Hz) on stack.
175                         \ Put desired picture rate (in 100*Hz) on
                            \ stack
*/                          \ Calculate picture period
                            \ (1.75 pictures/sec).
1 65535 LIMITS              \ Limit picture period result to the range:
                            \ 1 to 65535 frames/picture.
SET_FRAMEPERPIX             \ Set picture period (frames/picture).

1 SET_ANIMATION             \ Enable animation.

+MODIFIED                   \ Remember that the signal format has been
                            \ modified.

amendVideo                  \ Adjust signal generating hardware to do
                            \ animation.

RESTORE-FORMAT              \ Disable animation and return the signal
                            \ format to its original state using previous
                            \ snapshot.
```

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